



Kennel Management System

By

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Submitted in Partial Fulfillment of the
Requirement for the Degree of

Master of Science

in Technology Management
Assumption University

February, 2003

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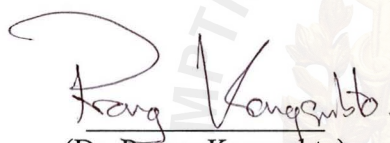
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ABSTRACT

Nowadays, pet industry is changing from the past tremendously. The amount of pet owners has increased extremely during the past few years. The quality of breeding and kennel management are becoming a critical success factor of kennel to gain competitive advantages. One of the most dramatic influences on business today is being driven by technology. Technology is driving change at an unprecedented pace. One change that is significantly altering the traditional business landscape is how technology empowers consumers, who are now beginning to enjoy the upper hand in their relationship with business. The shift of power creates opportunities, and also presents the potential for disaster on a far greater scale for business that chooses to ignore the issue.

This project aims to study the characteristics of the kennel management in Thailand. The main area to explore will be the dog kennel business. The research will also try to study the opportunity and apply technology in the pet industry. Furthermore, it is aimed to improve quality of kennel management in terms of breeding and customer relationship management.

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CHAPTER 1 : INTRODUCTION

1.1 Project Background

Nowadays, the trend of having a pet as a man's friend is becoming popular. Not only in Thailand, the popularity seems to spread out across many major Asian countries such as Japan, Indonesia, Malaysia, etc. People in those countries like Thailand, are interested to in raising a dog as one of family members. The increasing demand in dogs has brought the growth of dog industry in many segments : dog health care supplies and services, dog food as well as dog's breeds. Then many home kennels and professional breeder kennels were founded during these past few years and many kennels have been successful in term of financial returns. Nevertheless, the standard quality of breeding dogs in Thailand still lack behind and thus causing the continuing import of the expensive stud and bitch as the sire and dam due to the lack of knowledge in breeding. Moreover this problem is not only kennel level but also the home customers. The consumers do not know how to select the qualified characteristic of pure breed such as standard size, head, neck, top-line, body, tail, forequarter, hindquarter, coat, color, gait, and temperament. So the education on consumers and kennels is necessary in order to lift up the quality of breed development.

The impact of unprofessional breeding of home kennels and pedigree issue brings great risks to many following generations of dogs. Most home kennels tend to breed the litter for extra money and hope to capitalize on popularity and low knowledge of customers. These home kennels sell their home litters in a great deal cheaper price than professional kennels in order to please customer expectations. This situation forces high burden to professional kennels because of long term investment and effort of development from

generation to generation. The result of uncareful matching selection between the sire (male dog) and the dam (female dog) is not easy to notify at babies dog stage, but most of unqualified characteristics will reveal itself when the dog reach its adult stage or when its particular dog having the next generation of litters. This finally leads to continuing of pure breed import and not being able to change its position to be an exporter and breeding center, even though Thailand is set as one of major international competition rounds with 2 contests per year in summer and winter.

This study is intended to provide professional kennels with some kennel management software in term of breeding and continuous improvement of dog profile.

1.2 Project Problems

Breeding process is actually complicated and repetitive work. The breeding analysis for matching selection and testing takes a lot of time to view a variety of breeding relationship and technique. Moreover, if the breeding planning is set ahead for 3 or 4 generations in advance with the mixture of different techniques, the possibility of each scenario is not easy to comprehend by only human capabilities. For example assuming that generation 10 of dog is examined, the result will show 2,046 ancestors in the level. So the challenge is how breeder can mix characteristics of these ancestors in each level to yield the desired characteristics of the next generations.

1.3 Project objectives

- To study the dog breeding process and matching selection of kennels in Thailand.

- To apply information technology in traditional low technology pet industry by providing the breeding selection software and web based system for breeding development.
- To make kennel management software for both kennel owners and pet owners to assist health care schedule and other important records of their own dogs.



CHAPTER 2 : LITERATURE REVIEW

2.1 Background of literature review

This chapter presents the review of literatures concerned with this project which is separated into two parts. The first part mentioned breeding, customer relationship management (CRM), web database and web page design. Also, the overview of kennel management must be reviewed in order to understand the general process and characteristics of business. The second part is about pet industry both in Thailand and abroad. Besides, the previous research in Thailand about the web based one is stated in this project also.

2.2 Parent discipline

2.2.1 Identifying the overview of kennel management

Good management, including accurate record keeping, is essential for a successful kennel operation. The primary purpose of any record system is to correctly record needed information in the simplest form possible. Registration forms or information cards for a breeding kennel should contain dog's age, dog's ancestry, registration or identification number, breeding and whelping dates and health or dietary information.

For boarding, the dog's age, health and/or dietary information, the owner's address and phone number, and the veterinarian's phone number should be recorded. This need not involve an elaborate record-keeping system, but kennel managers should establish certain guidelines to maintain accurate records of kennel dogs.

Accounting procedures used in commercial kennels can be quite diverse because of the different types and sizes of operations. Some records of small kennels can be kept on a large calendar, whereas larger kennels need more detailed records and accounting procedures. For large kennels, a certified public accountant (CPA) should be consulted to ensure that proper business records are kept. All accounting records should meet the minimum requirements of the Internal Revenue Service.

Accurate health information should be maintained for kennel populations including a record of vaccinations, physical examinations, routine parasite checks, treatments and other health information for each dog.

2.2.1.1 Computerized system for kennel management

Computerized kennel management systems are now being developed to help make kennel management more efficient from both the standpoint of financial management and maintaining accurate and easily updated information about each animal.

Linear programming, an important computer technique, will enable a manager to explore a variety of plans for future direction and/or expansion of his or her operation. By evaluating several variables within the individual business, the manager can compare plans and choose the one that promises the highest return.

Computerized records can be used in breeding operations to keep management up-to-date and to quickly identify problems to be addressed or work to be done. These reports can be obtained when desired. Some of the records that can be kept by computer including pedigrees, registrations, identification numbers, whelping information, health records for each animal etc.

Properly kept records (by hand or computer) depend upon interested personnel who carry out the day-to-day operations. The kennel owner or manager should prepare a description of daily animal care and maintenance procedures. Developing kennel worksheets that describe various tasks and schedules will help kennel personnel accomplish their respective assignments more efficiently.

2.2.2 Identifying selective breeding concept

According to the electronic journal, Communication and Educational Technology Services, University of Minnesota Extension Service, stated that selective breeding is a process that people try to keep or acquire particular desirable characteristics of dogs. The process is behind the tremendous variation reflected in modern dog breeds. Whether by accident or design, as dogs with particular morphological (physical) characteristics became distinctive, they were also recognized for behavioral traits and for the services they began to perform for man. As particular dogs became recognized as better than average at hunting, retrieving, tracking or herding, humans selected mates for these dogs that looked similar or showed similar abilities. These breedings frequently resulted in offspring with similar or improved capabilities.

2.2.2.1 Breed development

As particular morphological characteristics became more clearly associated with the ability to perform valued services, the ancestors of our present-day breeds appeared. When breeding for characteristics became more predictably associated and refined in subsequent generations, the early breed specimens began to take on what today's breeder

calls type. In other words, individual dogs began to resemble their more immediate ancestors and others closely related to them more than they resembled distant ancestors and dogs not closely related to them. The inherited similarities and differences could often be observed both in physical characteristics and in particular aspects of behavior. However, the selection criteria were limited only to characteristics that could be directly observed (phenotype) in a dog or its offspring.

2.2.2.2 Types of breeding

1. Outcrossing

Out crossing is where the sire and the dam are totally unrelated, preferably for three or four generations. The true form of an outcross is between two entirely different breeds because in reality the members of most registered breeds come from a common ancestor. It is very rare for outcrossed puppies to be very uniformed in appearance. Usually there are very large ranges of sizes, coats, colors, markings, and other distinctive characteristics. This does usually result in a heterozygous litter. This tends to produce healthier puppies, but not always. Also, many of the desired characteristics of the breed are quickly lost. The pups are not usually show quality although there are exceptions. These pups also do not tend to reliably reproduce themselves. Through out crossing, many health problems can quickly be eliminated or just as quickly added into breeding. But usually some show quality and product ability are sacrificed.

There are variations on outcrossing. A "true" outcross could be a dog that has totally unrelated dogs bred together throughout the pedigree. This is very rare. On the other

hand, "line crossing" is a form of out crossing where dogs from unrelated lines are bred to produce a new line. The sire and the dam are usually very line bred from their prospective lines and the resulting puppies are varied in appearance: some looking like the sire's line and some looking like the dam's line and some looking like mixtures of both lines.

2. Line Breeding

Line breeding is when the sire and the dam are distantly related: e.g., grandsire to granddaughter, grand-dam to grandson, second cousins, half cousins, uncle to niece, aunt to nephew. This is the most common form of breeding in purebred dogs. Through this breeding strategy, new genes are slowly introduced and unwanted genes are slowly replaced. This method sacrifices little overall in terms of show quality. Usually the puppies are rather close in general conformation. The only problem with this method is that it often takes several generations to get poor genes out or adding desired genes in, resulting in many puppies that have the same genetic problems as their parents. This is referred to as reaching homozygous litters that more genes of the same kind are apparent in the puppies.

3. Inbreeding

Inbreeding is where the sire and the dam are closely related: mother to son, father to daughter, sister to brother, half sister to half brother, cousin to cousin. It is the quickest way to find out what poor genes are in the line and what dominant characteristics are in the line. This breeding method is an extremely useful tool for

diagnosing what genes are present. If the genes for bad eyes are present, but hidden or recessive, this will bring them out to their full extent. Theoretically, if there is not any bad genes, then the puppies will be of very close uniformity and very able to reproduce themselves. This is a homozygous breeding. The resulting puppies will have a lot of genetic material that is the same as their parents and grandparents and will be close genetically to each other.

Inbreeding does not introduce new genes and does not eliminate bad genes that the line already has. It only shifts them around like a rubix cube. This often results in litters with high show potential. But there are drawbacks. Inbreeding exclusively will eventually lead to infertility. Inbreeding increases the chance that a gene obtained from the sire will match one obtained from the dam, both stemming from the common ancestors on which the individual was inbred. Thus, inbreeding tends to make animals homozygous rather than heterozygous. The inbreeding coefficient measures the resulting increase in homozygosity. All breeds have a given degree of homozygosity; the mating of two dogs from the same breed would not produce a recognizable specimen of the breed.

Inbreeding can increase homozygosity and decrease heterozygosity. So it can duplicate both desirable and harmful traits, both of which can be unsuspected in the line, and may appear. Inbreeding does not create anomalies, it brings present anomalies to the surface. Even when the anomalies are present, inbreeding might not reveal them.

An increase in harmful recessives is undesirable but it is not a major drawback if they are identified early. The effect of inbreeding on major polygenic traits is greater.

Generally, traits that are highly inherited are not adversely affected by inbreeding but, traits under non-additive control, especially those tied to dominance and thus not of high heritability, are often markedly harmed by inbreeding.

2.2.2.3 The percentage of blood

The percentage of blood attempts to measure the genetic contribution of a certain ancestor to a selected dog or a proposed litter. It is calculated by summing the contributions for the ancestor each time that ancestor appears in the pedigree, and is adjusted by the factor $(1/2)^n$, n is the number of generations back in the pedigree, e.g., for a sire or dam, $n = 1$ and therefore the Percentage of Blood from either parent is 50%, for a grandsire or grandam, $n = 2$, giving a Percentage of Blood of 25%, etc. The percentage of blood is often used when inbreeding or line breeding is discussed. (James E. Seltzer, 1998)

If a prominent ancestor appears frequently on one side of a pedigree, say, the sire's side, but does not appear at all on the dam's side, that ancestor might contribute a relatively high percentage of blood. Nonetheless, the inbreeding to this ancestor will be zero. A breeding program that maximizes the percentage of blood contribution from an especially desirable ancestor while at the same time minimizes the coefficient of inbreeding might build upon the genetic contribution of the selected ancestor while the risks entailed in inbreeding are being reduced.

2.2.3 Identifying the customer relationship management concept

“The practice of building long-term satisfying relations with the key customers in order to retain their long term preference and business” (Kotler, 1997). In the present business

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world, smart marketers try to build up long-term, trusting win-win relationships with valued customers. They accomplish this by promising and delivering high quality, good service and fair prices to the other parties over time.

An international consultant firm uses the following definition of CRM: "An integrated strategic approach to capture disproportionately high share of value from current and potential customers by using proprietary customer information effectively" (CRM Forum, 1999)

In other words, Ravi Kalakota and Marcia Robinson defines CRM as an integrated sales, marketing and service strategy that precludes lone showmanship and depends on coordinated actions. They defined the goals of CRM business framework as follows:

- Use of existing relationships to grow revenue. Composition of a comprehensive view of the customer to maximize his or her relationship with the company through up-selling and cross-selling. Enhancing profitability by identifying, attracting and retaining the best customers.
- Use of integrated information for excellent services. It is about saving time and easing frustration for customers. Customers should be surprised at how well the company knows them.
- Introduction to more repeatable sales processes and procedures. With the proliferation of customer contact channels, many more employees are involved in sales.

- Creation of new value and instill loyalty. This is the point of difference or competitive advantage of the company. It is the company's ability to respond to needs and accommodate requests of customers.
- Implementation of a more proactive solution strategy. Use of customer focused business solution that works across the entire enterprise instead of just gathering data and eventually using it. Moving from reactive data collection to reactive consumer relations that resolve problems on the first calls.

Based on the above goals, becoming customer-focused does not necessarily mean improving customer service. It means having consistent, dependable and convenient interaction with customers in every encounter. CRM is an integration framework of a business strategy, not a product. Putting CRM business strategy into practical requires developing a set of integrated applications that address all aspects of front office needs by using and integrated support across the range of business functions.

2.2.3.1 Customer relationship management process

According to the suggested three phases of CRM of Ravi Kalakota and Marcia Robinson that have different impacts on the customer relationship, those are acquisition, enhancement and retention. All phases of CRM are inter-related. However, doing all three phases well is a difficult proposition, even for the best companies. Companies often have to choose which of these dimensions will be their primary focus, but choosing one dimension to master does not mean abandoning the other two. The choice will dictate the technology infrastructure strategy. Not choosing means trouble. It means hybrid

processes with diverse technological requirement that have consequently caused confusion tension and loss of focus. Each phase of CRM will be explained as follows:

1) Acquiring New Relationships

Beginning a new business relationship is much like going for the first date. There is insecurity, hesitation, some fear and anticipation. It takes a determined suitor to overcome those obstacles. Similarly acquiring new customer demands a great deal of planning, which translates into an integrated experience. It is the result of an intricate and finely tuned sales and services integration strategy. Potential customers are very impressed when companies call them while still they are browsing their web site. Preliminary research shows that the probability of sales goes up when prospects receive a response to their request within one to three minutes. The company can acquire new customers by promoting product or service leadership that pushes performance boundaries with respect to convenience and innovation. The value proposition to the customers is the offer of a superior product backed by excellent service.

2) Enhancing Existing Relationships

The company can enhance the relationship by encouraging excellence in cross-selling and up-selling. Companies prove their commitment by taking time to hear customers' concerns and by developing a service focus. Call center is one effective application for developing and maintaining relationship. For instance, when a customer calls about a product, the agent can automatically suggest a complementary item (cross-selling). Moreover when a buyer who has selected a camera can be offered a tripod; an agent can suggest a similar product of better quality (up-selling).

3) Retaining Customer Relationships

Like personal commitment, business relationships need patience and understanding. Retaining customers require a complete understanding of the needs of the customers and a determination not what the market wants but what the customers want. The value proposition to the customer is an offer of a proactive relationship that works in his or her best interest. Today, leading companies focus on retention much more than on attracting new customers. Some preliminary researches show that even a five percent increase in customer retention can increase profits by as much as eighty five percent. To increase the profit, companies have to hold on the good customers; however, it is not easy to do, either.

2.2.3.2 Identifying the electronic customer relationship management (E-CRM) concept

Customer Relationship Management is quite a new concept. Businesses have been practiced for centuries. The difference today is electronic technology, which has exponentially increased both the speed and the volume of information. However, the key word still is “Relationship”. In order to reach and serve customers, those companies use many types of electronic interactions such as e-mails, website FAQs, self help applications, remote help centers for sales and after sales support and inbound and outbound call centers for telemarketing, technical support and service. More than ever, this abundance of choices puts customers clearly in control.

At present, CRM becomes a market imperative. Due to the growth of e-business, the sense of urgency-especially in industries where established businesses are waking up to

find their market share being eroded by dot com upstarts. Correctly gauging the potential of the electronic market place, a number of early adapters devised e-business and customer relationship strategies that were tightly linked to their core businesses. To grow their customer base and better serve existing customers, they implemented more than just a glamorous web presence.

Well-planned and well-executed CRM solutions can have a significant long-term impact on both the bottom line (e.g. reducing administrative and customer support costs, speeding up order to delivery cycles for faster, better customer service), as well as on the top line (e.g. increasing the dollar value of existing customers, increasing sales and profitability). The important thing is to do it right. One of the greatest benefits of integrating front-end CRM solutions with back office business processes is improved business intelligence (BI). Then, data can be captured at every point of customer contact from order entry to fulfillment – whether that contact is by telephone, fax, call center or website. Using data warehousing and online analysis tools, companies can transform these raw data into valuable information to help them increase competitiveness in their market place.

2.2.3.3 Next generation of E-CRM infrastructure

The trend of CRM in the future is integration. Ravi Kalakota and Marcia Robinson (1999) suggest five types of integration to be effective in the next century as follows:

- Integration of customer content: The ability to access, manage and process all relevant customer content, including the seamless integration of structured and

unstructured customer data, has emerged as a key requirement for CRM application today. With the push of CRM, companies are beginning to recognize how to integrate these critical data. The integrated picture of customers allows for numerous service and sales opportunities, as well as level of service distinctions for the best customers.

- Integration of customer contact information: Contact Management (CM) is defined as the electronic capture of customer information with the capability to access and share information throughout the organization for sale and service purposes. Today, customer inquiries and transactions are coming from the call the center, the Internet and many other channels. Capturing and sharing these interactions within an organization should be top priority. A well-designed CM infrastructure allows a company to create a virtual contact center that centralizes information and makes it available 24 hours a day as well as, seven days a week across all service delivery channels. CM information can be accessed in the “here and now” to provide service during interaction with customers and it can also be accessed off-line, extracted to a decision support system for further analysis and sale opportunities.
- Integration of end to end business process: Companies must have cross-functional process integration because business environment becomes focused on anticipating and addressing customer needs. Today, prospects and customers want to access companies from a variety of places in order to obtain fast, accurate and consistent information. They want service both before and after sale. Then, today service must start before the sale and be inherent in every interaction a customer has with the company. Web offers an unprecedented opportunity for organizations to achieve an end-to-end, integrated sale and service environment. Moreover, web is now becoming

an interactive customer care and fulfillment center that can handle multiple channels of communication. This shift places a premium on highly integrated customer self-service interaction.

- Integration of the extended enterprise: Deploying a tightly integrated front office throughout a company is not enough. Sharing customer information with partners or the third party is absolutely critical as companies come to depend on outside alliances. The partners will enable companies to share leads or customer support issues with the everyone who comes in contact with customers, regardless of whether they work for the company or not. To provide the kind of service that guarantees customer loyalty, companies must extend to their partners and vendors a CRM infrastructure via Internet, Intranets and extranets. Through this infrastructure, partners can share information, communicate and allocate with the enterprise.
- Integration of system: The demand for complete relationship management is driving the need to integrate telephone, web and database technologies to provide a 360-degree view of customer attributes and account history. Execution of this strategy requires four enabling technologies that must work together to provide some punch to CRM infrastructure. These technologies are Legacy systems, Computer Telephony Integration (CTI), Data warehousing and Decision support technology.

Therefore, to build appropriate infrastructure in the next generation of E-CRM, there are many intelligent software packages that can help the companies to meet their customers' diverse needs. Most of the software is trying to cover all components of the company's

operation such as marketing, sales, service functions, call centers and Internet business delivery mechanism.

The driving principle behind those softwares is the customer centric enterprise. This allows companies to better understand their customer relationships, value and profitability. Moreover, turning traditional CRM concept into the E-CRM is one of the most critical points to concern.

2.2.4 Web database

“A web database is a data store or information repository that can be accessed via a query language or programming API. Unlike conventional database systems, however, with Web databases, this access is not typically performed using instructions typed at a command line or issued through interfaces that are custom designed for use on a specific computer platform.” (Swank, Kittel and Spenik, 1997)

Web database are accessed via other Web applications, specifically forms that are developed using standardized hypertext markup language or HTML tags, ActiveX controls, and client-side scripts using VBScript and JavaScript. Using facilities available in HTML, applications programs on the Web server are accessed through server-side programs via CGI (common gateway interface), server-specific interfaces such as Microsoft's Internet Information Server (IIS) application programming interface (ISAPI) or server-side scripting environments such as IIS's Active Server pages (which use Visual Basic). HTML form interfaces enable you to create applications that integrate

database functionality and provide access to organizational data repositories on behalf of Web clients - a user and browser. With web database, the applications can be designed solely for the purpose of querying a database and returning specific information. The application can also use information pulled from a database to support more comprehensive applications. This capability to integrate a database into applications that can be accessed by users utilizing a Web browser is what makes a database a Web database.

2.2.5 Web page design

The design of the web page is a very important factor to point how good a particular web page is. It can affect the audience either to leave the site or come visit again. Therefore, the web builder should not ignore or overlook the importance of this issue.

The basic principles of web design (William and Tollet, 1998) are as follows:

- **Alignment**

Alignment simply means that items on the page are lined up together. Lack of alignment is the single most prevalent problem on web pages. It is a big problem on printed pages as well, but it seems to be even more ubiquitous and disastrous on web pages. The rule is choosing one alignment and use it on the entire page. Do not mix alignments.

- **Proximity**

The principle of proximity refers to the relationships that item develop when they are close to each other, in close proximity. When two items are close,

they appear to have a relationship, to belong to each other. When items are physically far from each other, they do not have relationship. Often on web pages, many items are orphaned unnecessarily, and many other items have inappropriate relationships.

- Repetition

The concept of repetition is that throughout a project you repeat certain elements that tie all the disparate parts together. Each page in the website should look as if it belongs to the same web site, the same company, the same concept. Repetition makes this happen.

- Contrast

Contrast is what draws your eye into the page. Contrasting elements guide your eyes around the page, create a hierarchy of information, and enable you to skim through the vast array of information and pick out what you need. The contrast might be typed in a bolder, bigger, or a very different style. It might be of different colors, graphic signposts, or spatial arrangements. To be effective, contrast must be strong. Do not be a wimp. If two elements, such as types, rules, graphics, colors, textures, etc., are not the same, it will be very different. Do not make them almost the same.

Moreover, the readability and legibility are the factors that must be concerned. There are a number of guidelines to follow as follows: (William and Tollet, 1998)

- Generally, use a serif typeface for extended text because it can be easier to read in shorter amounts of text.
- Size of the font should not be bigger than 14 points and smaller than 10 points.
- Never set large amounts of text in bold, italic, caps, small caps, script, etc. Small amounts of these are all right when necessary.
- Avoid very long lines of text. Long lines makes it difficult for the reader's eyes to find the beginning of the next line, especially on a screen.
- On the screen, shorter lines are better than longer lines, but avoid very short lines of text. People read groups of words, not one word at a time, so very short lines break up the thought patterns too much.
- Make sure there is enough contrast between the type and the background. Black text on a white background is best.

2.3 Immediate Discipline

2.3.1 Identifying Pet industry

According to the American Pet Association's statistics as of 1998 (to be updated in 2003), there were approximately 43 million dog owners who owned 62 million dogs, and about 34 million cat owners, who owned 75 million cats, for a total of 137 million pets. The annual report of year 1999 of PetSmart, Inc. mentioned about these pet owners that they are "passionately committed to their pets" and regard their pet as "a family member." The American Pet Association's statistic also shows that these pet owners treat their pets much like their own children or other family members by buying them gifts, celebrating their birthdays or displaying their pictures. 28.5 million dog owners

purchased Christmas gifts for their dogs. More specifically, 9.8 million dog owners celebrated their dog's birthday, such as by giving their dog a special treat, meal, cake, ice cream, new toy, or a new bone. Around 5-10% of these owners sang or wished their dog a happy birthday, gave their dog a party with other dogs or pets, took their dog to a favorite place, or took birthday photos.

According to the study of Business Communication Company, pet foods is the largest segment of the industry at 47% of the market, the most rapidly growing market segment is pet supplies, which represents 5.5% of the market. These supplies include dog and cat toys, collars and leashes, cages and habitats and books. This segment is projected to increase from \$5.2 billion in 2000 to \$6.9 billion in 2005. Other pet services, such as training and pet care, accounting for 2.2% of the market, are expected to increase from \$5.2 billion to \$6.9 billion in 2005. The other major pet industry category, veterinary services, with 4.6% of the market, is expected to increase from \$7 billion to \$8.8 billion during this same period of time.

For pet industry of Thailand, pet food and pet care products are considered as a high-potential market with great opportunities for growth. The overall market performed very positively over the review period as a whole, with a CAGR (compound annual growth rate) of almost 22% in current value terms, and an expected increase of 16% in 2003 alone. Dog and cat food accounts for by far the largest proportion of sales, with an estimated value share of 78% in 2003, compared to 67.7% in 1998. Moreover, dog and cat food also looks set to demonstrate the most dynamic performance in 2003 in both volume and value terms.

2.3.2 Previous research in Thailand

In 2003, Phimthunthip L studied pet database online and website development for vet clinic business. The study is about to develop the website for vet clinic in order to give the convenience to both of clinic's personnel and the customers. The use of proposed system helps clinic's personnel to save time in keeping and retrieving record of pet. The system allows the customer to enter the website to check information about pets at anytime. Besides, the appointment can be made or postponed by customer themselves via internet.

In this study, the proposed pet database online and website is designed to be based on the gathered data from questions that are given to the vet clinics and their customers. The selected tool to create proposed system is Active Server Page application. However, the study only proposes the demo in order to show the concept and basic ideas of database online and website. The researcher suggested the further features to support the task of vet clinic and achieve the most satisfaction of user, both of clinic's administration and clinic's customers are as follows:

- The data of name, breed, medicine or anything that must be spelled should be provided to avoid misspelling.
- The appointment schedule of doctor should be shown in the website and allow the customer to make an appointment themselves
- E-mail alert feature should be able to be sent by the program automatically
- The data is unchangeable and uncollectible
- The security and privacy policy must be stronger

According to the study of Ajjima A., 2000, there are several ways to contact with the customers for giving the services. To provide service to customers effectively, the organizations should have many choices to improve their services. For this study, the proposed system was designed to solve the problem of paper work that caused the service to delay. The new system had used Customer Service Program to help in the work process. There were keeping records of customers and keeping the details of customer's problem about their products that the customers requested the agent for answers. In addition, the new system helped to quickly respond to the customer's demands. The advantages of the web-based system are as follows:

1. The system provides service to customers effectively
2. The system helps customers to reduce the cost of using paper documents by using electronic document
3. The system can be connected to the internet
4. The system can be viewed in terms of the performance of each agent and it can assign jobs to agents. Moreover, the system is able to be used for searching information.

CHAPTER 3 : METHODOLOGY

3.1 Project Design

This chapter discusses the methods used in this project. In order to achieve all objectives of the project, all concerned activities are conducted as follows:

1. Observation and interview with dog owners and breeders at dog competition events
2. Identify the breeding problems and breeding database
3. Get user's requirement and design of software and web page
4. Design software and web page
5. Evaluate the software and web page
6. Conclusion

3.2 Project Process

3.2.1 To get the primary data, an observation and interview with dog owners and breeders are conducted. Location to collect the data is the dog competition events which were held at these following places: Central Bangna, The Mall Bangkok, Seacon Square and Impact Arena.

3.2.2 Observation is one of the selected techniques for data collection. It is systematically planned and executed, uses proper controls, and provides a reliable and valid account of what happened. The advantage of observation is it enables the observer to collect the original data at the time they occur. Besides, the observer can secure information that most participants would ignore either because it is so common and expected or because it

is not seen as relevant. The observation method alone can capture the whole event as it occurs in its natural environment. The subjects accept an observational intrusion better than they respond to questioning. However, there are some limitations. The observer must be at the scene of the event when it takes place. Moreover, it is limited as a way to learn about the past. It is difficult to gather information on such topics intentions, attitudes or opinion. Therefore, the observation should be used with other data collection technique in order to get the complete information required.

Another technique to collect the data is personal interview which is a two-way conversation. The advantages of interview are the acquired data that are in depth in detail and the ability of interviewers to accomplish a high degree of control. Also, it provides maximum interviewers flexibility for meeting unique situation. Before the interview, the customer will be explained what kind of answer is required and how complete it should be. This will help interviewers to obtain the right direction of data. In order to make the interview effective, the respondent must possess the information being targeted by the investigative questions. The understanding of his role in the interview as the truthful information provider is a must as well. Although the conducting of interview could bring the information as interview's requirement, there are disadvantages that are bias and cost. These should be considered and compared with other fact-finding techniques.

3.2.3 Getting the user's requirement is an essential step for system designing. The scope of the activity for the new system is to solve the user's problems by proposing a computer program in web based solution. The method used in this project in order to get the user's requirement is personal interview. The using questions are open-ended that allows interviewee to answer in terms of explanation. *See interview details in appendix 2.*

3.2.4 In order to better understand the logical movement of data, these following structured analysis and design tools are used:

- Data flow diagram

Through this approach, the system analyst can put together a graphical representation of data processes throughout the system. The data flow approach emphasizes the logic underlying the system. Four basic symbols: a double square, an arrow, a rectangle with rounded corners, and an open-ended rectangle, are used to chart data movement. The double square represents an external entity that sends data to or receives data from the system. The arrow defines the movement of data from one point to another, with the head of the arrow pointing toward the data's destination. A rectangle with rounded corners is used to show the occurrence of a transforming process. And an open-ended rectangle represents a data store.

- Context diagram

The context diagram is the highest level in a data flow diagram and contains only one process, representing the entire system. The process is given the number zero. All external entities are shown on the context diagram, as well as major data flowing to and from them. The diagram does not contain any data stores and is fairly simple to create, once the external entities and the data flow to and from them are known to analysts from interviews with users and as a result of document analysis.

- Entity-Relationship Diagram (E-R Diagram)

To define proper system boundaries, an entity relationship model must be used. The elements that make up a system can be referred to as entities. An entity may be a person, a place, or a thing. A relationship is the association that describes the interaction among the entities.

3.2.5 Software and web page designing

- An application tool used in this project is Active Server Page (ASP), which is a feature of the Microsoft Internet Information Server (IIS). ASP gives Webpage developer the advantages over standard Web application development. It combines HTML with script in the same file for better application flow. The Webpage developer does not have to worry about the browser's script capabilities because the scripts are processed on the server. Besides, ASP supports VBScript and Jscript.

3.2.6 To evaluate the software and website, the user's acceptance test (UAT) is developed to ensure that the system meets design requirements, work properly, and truly help them do their jobs efficiently and effectively. A checklist is used as a tool to test the acceptance of the user.

CHAPTER 4 : ANALYSIS AND DISCUSSION

4.1 Study the existing system and analyze it

According to the interviewing with the kennel's breeder, the qualities of breeding selection and history data record of each individual dog are essential issues which all kennels emphasize on. Every kennel gives importance to breeding process and mating result as a critical factor in terms of pure breed development. The breeder attempts to maintain good desired characteristics of ancestor and eliminate undesired characteristics at the same time through each kennel breeding technique.

The targeted bitches or female dogs are programmed for breeding at least a year in advance. There are many things to prepare before actually performing a breeding of two candidates. The most importance is whether both male and female dogs are of breeding qualities that will conform to breed standard. The features would cover the structural characteristics, correct temperament, and good movement. Once the dog has passed all the selection criteria, then the breeder will make an in-depth analysis in dog pedigree by delving back to a dog generation. Normally, 5 generations backward are recommended and contains enough relevant information to the dog's past genetic consideration. Understanding of genetics in pedigree is vital but performing mating analysis through pedigree is quite repetitive and time consuming work due to investigation of 124 dogs in 5 generations. So the computerized module in the kennel management system will possibly help the breeder very much in performing simulation of mating analysis. The example of how to make mating analysis in terms of breeding percentage is shown as follows:

The process of selective breeding is based on the type of breeding program whether that breeding is inbreeding or outcrossing. This begins by selecting a sire and a dam. Many factors related to both dogs will be examined such as physical characteristics, and history of mating results. Then, the breeder will do the trial mating sire and dam as in the follows:

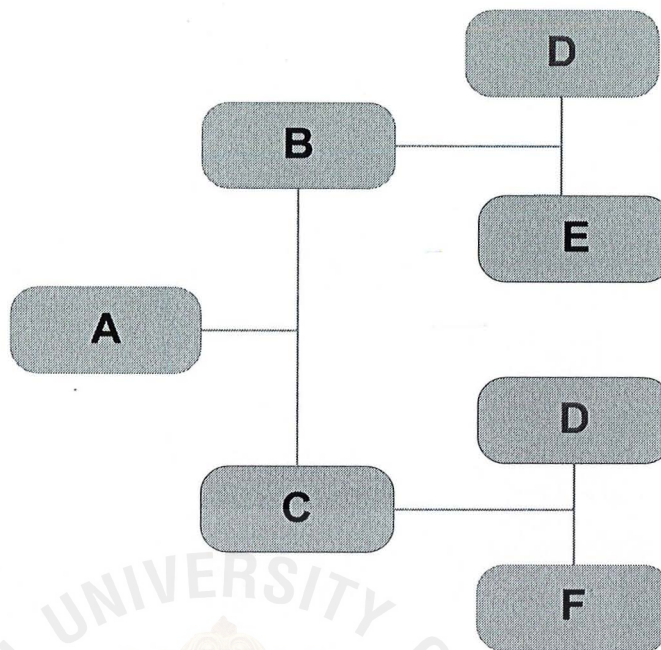
1. Examining the pedigree by tracing back of both the sire and the dam

The pedigree of both the sire and the dam will be traced back to the ancestors in previous generations between 3 to 6 generations to check whether the past relationship of the sire and the dam existed or not. The level of closeness in that relationship will identify the in breeding, line breeding or cross breeding.

2. calculation of the percentage of blood

The calculation is done to analyze the percentage of blood of common ancestor in the litter that will be given from that mating. The calculation method can be described below:

Figure 4.1 Matching selection



Source : Developed for this project

For example, the father B and the mother C of the individual A, both have the same father D. If we consider A, there will be 50% of blood of B, and 50% of blood of C inside A itself ($B/2 + C/2$). While B consists of 50% of blood of D and 50% of E ($D/2 + E/2$). This method is also applied to the dam side. Blood of C consists of 50% of D and 50% of F ($D/2 + F/2$). Therefore,

$$\begin{aligned}
 A &= B/2 + C/2 \\
 &= (D/2 + E/2)/2 + (D/2 + F/2)/2 \\
 &= D/4 + E/4 + D/4 + F/4 \\
 &= D/2 + E/4 + F/4
 \end{aligned}$$

According to the above example, it can be explained that the blood of A will have 50% of D which shared a common ancestor, and 25% of E, and 25% of F. It can be predicted that by theory A will look like D more than B and C. However, in order increase the accuracy in mating analysis, the physical attributes of the past breeding results need to be examined and presented as a major factor before making the final decision.

At present, most kennels do not keep the database of the customers and records of sold dogs. So the crucial information disappeared and undesired variations could happen without enough scientific explanation of these sources.

4.2. Identify problems

From the above information, the problems can be separated into two parts:

1. The problems of the process in the sire and the dam matching selection

Due to the changing of customer trend, people emphasize in the importance of quality breeding more than it used to. The quality of breeding is seen as a guarantee for the beauty in pureness of breed. The customers are willing to pay premium to buy a dog if the litter is a pure breed with good breeding results. Hence, the processes and techniques of breeding selection to be a sire and a dam is the highlight of the kennel management system in terms of breed development. As mentioned, currently the kennels calculate manually the percentage of blood from the selected sire's and dam's characteristics. This method consumes a long period of time with many monotonous and repetitive work. Each time of matching, time consumes at least a half of an hour. Besides, the human error might occur in both examination and calculation.

2. The dog and owner information

After customers buy a puppy from a kennel, they always have questions about the dog they bought. Some customers may want to know about how to nurture it, like when the puppy should be given the vaccination. In some cases, the customers would like to know about personal data of the dog such as the date of birth, the breeding line, the first vaccination, etc. Despite the fact that these basic data could be found from the pedigree certification or the documents that are issued from the kennel. Therefore, the customers call the kennel and ask for the answers of their inquiries. However if the customer buys the dog from the kennel long time ago, the kennel may not be able to answer their questions due to the unavailability of database.

In addition, sometimes the customers consult with the kennel about the appropriateness in mating selection of their dogs. They may also request the kennel to find a sire or dam that meets their breeding requirement. Although there are many sires and dams in the kennel, they may not be likely as the requirement. The kennel has to look in the available data of the past sold dogs to response the customer's requests.

4.3 Get user's requirement and design the proposed system

Regarding to the mentioned statement, kennels are experiencing the difficulty in the process of matching selection between the sire and the dam. In order to be able to solve the problem and to continue improvement in development of highly productive breed lines of each kennel, the database, that present in both dog's characteristics and pedigree will help very much in mating decisions.

1. Basic information of each dog: this information module should be able to show at least the dog's name, pedigree code no, date of birth, sex, pedigree, and its pictures in different age.
2. For female dog, the tracking of the estrus period is very important for a breeder to be able to plan and forecast the mating schedule. Normally a female dog will have approximately 30 estruses for her whole life but the productive ages ranged from 2 to 8 years old. This will result in only 14 productive estruses. Furthermore, to keep the bitch in healthy condition and giving a good quality litter, the ratio of breeding and not breeding is 2:1, so this limitation will cause the number of productive estrus to be reduced to only 10 times in the bitch's whole life. Because of the fact that only in estrus period the bitch can give birth, the detailed information of this period is very critical for mating planning in advance.
3. There are so many techniques in breeding, selection depending on the purpose of each particular mating program. Generally the basic concept of a mating program will be found as in-breed, line-breed and cross-breed concepts in tracking pedigree consideration, and the other major factor is the physical characteristics of results of in past mating as shown on basic information module of each dog. However the second factor is based on skill and expertise of each breeder and his historical information. This kennel management system intends to help a breeder in terms of shortening time consuming in mating analysis and easy to make a mating simulation for comparison.
4. After successfully mating selection, the module of forecasting the whelping date and vaccine package date for the first 3 months of birth will be provided as

estimate locked date on mating and whelping calendar. The prediction will automatically be generated by using the average of 64 days of pregnancy. The vaccine package for the first 3 months uses normal medicine practice in Thailand.

5. The customer relationship and the family finding for a litter is the module identifying the customer database and the link between the dog's database and the owner's database since the litter has been delivered to a new owner. The owner of the dog will be eligible to be a member of a kennel club and be able to use the kennel management system to assist them to keep records and scheduling or any other purposes such as mating, breeding schedule, vaccination, photos, rewards, and training.
6. The vaccination scheduling module will allow the dog's owner to keep its vaccination history and allow any in-advanced setup for health care issue.

Furthermore, kennels are turning to focus on satisfying customers besides breeding. The kennels provide some level of solution in dog nurturing that could help in creating more customer satisfaction. The proposed system will allow customers to manage the records of their dogs by themselves and to track those records whenever they want. Not only will customers, be benefited, the ongoing database of dogs will also help kennels to increase the chance of breed development by finding the appropriate dog to mate.

4.4 System design

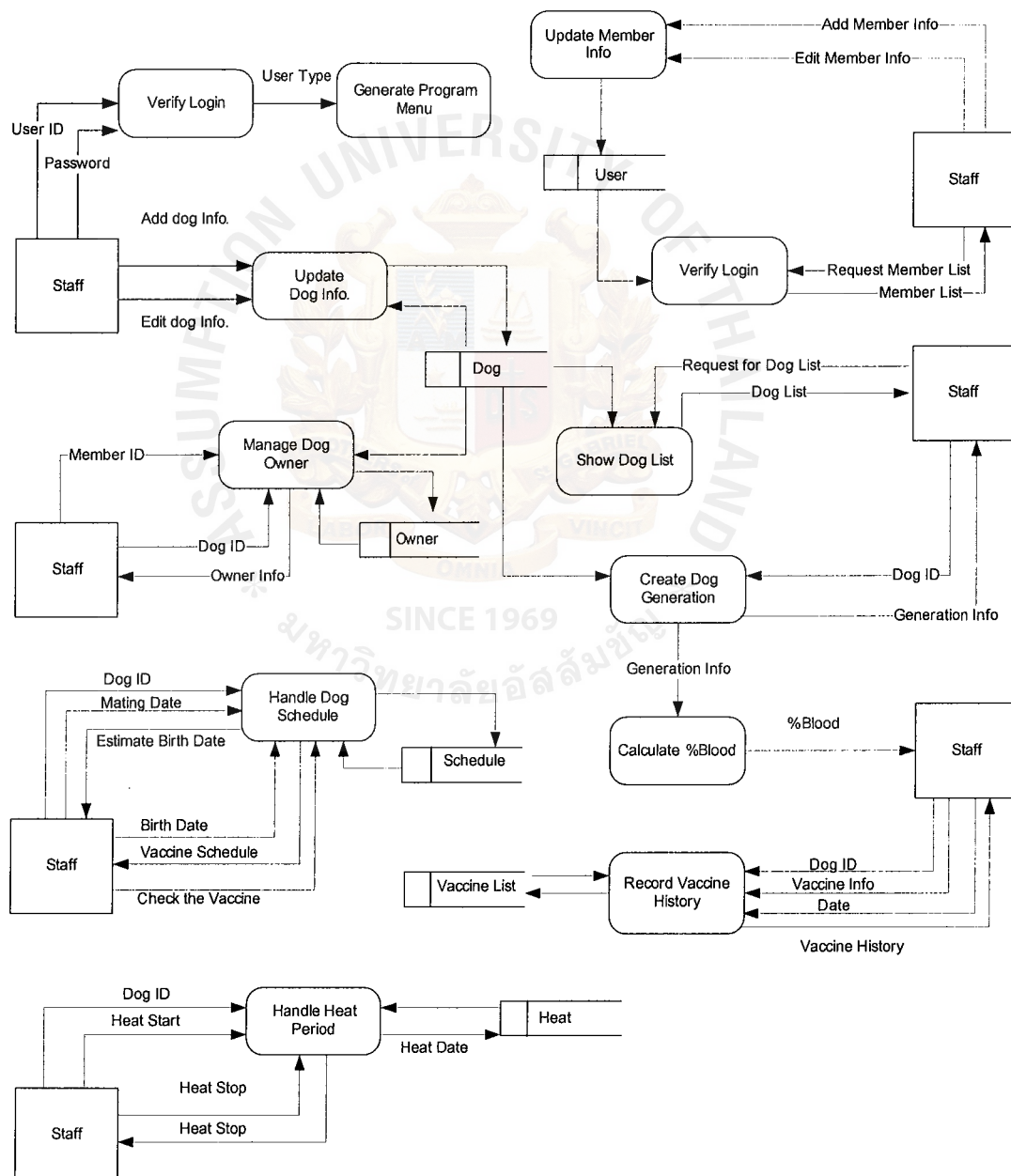
The system is developed based on the requirement of users. In order to achieve those conditions, the proposed system should consist of the following features:

1. Trial mating software

2. Web page

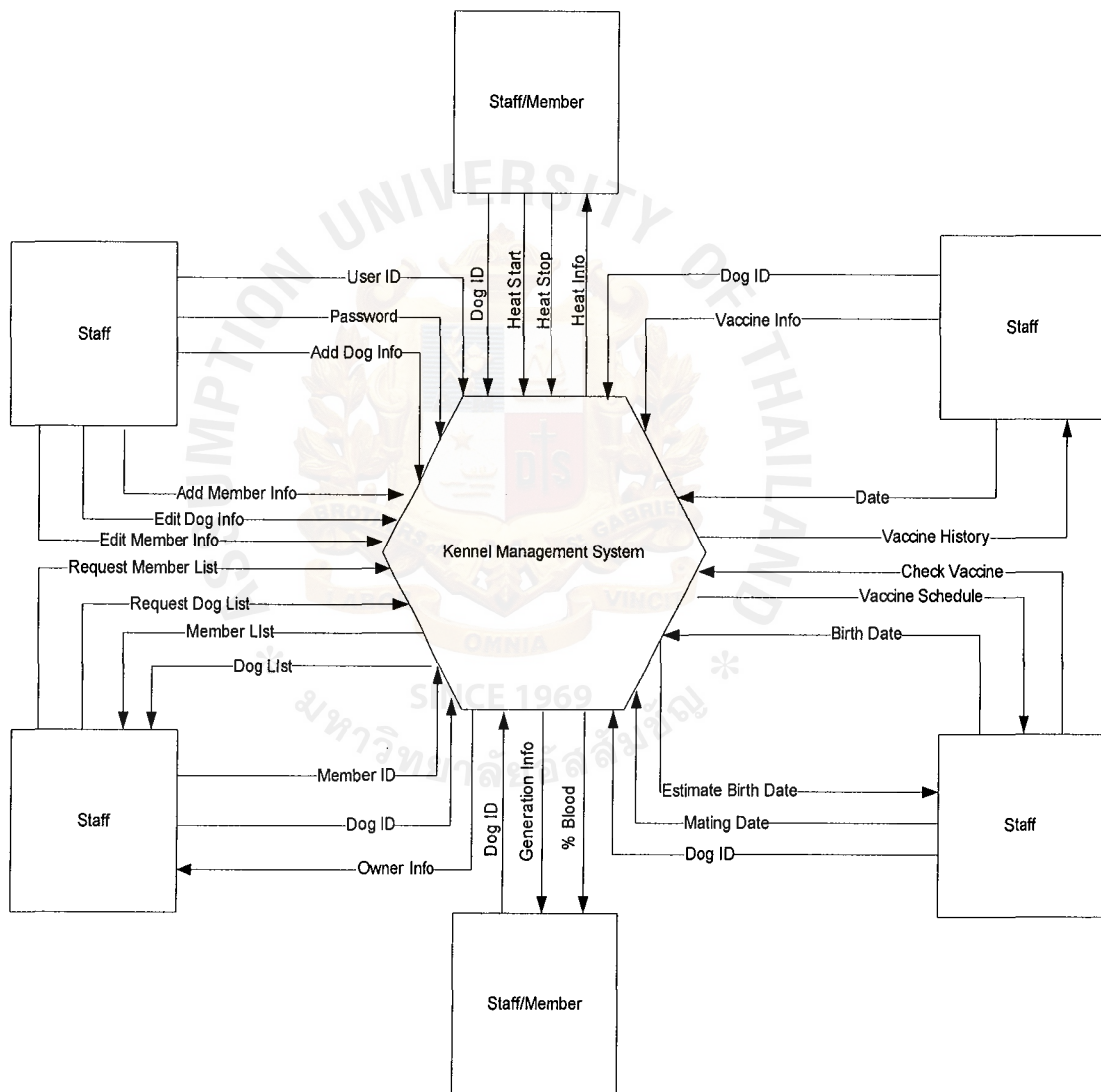
4.4.1 The model of the proposed system are as shown in figure 4.2 – 4.4

Figure 4.2 Data flow diagram : Level 0



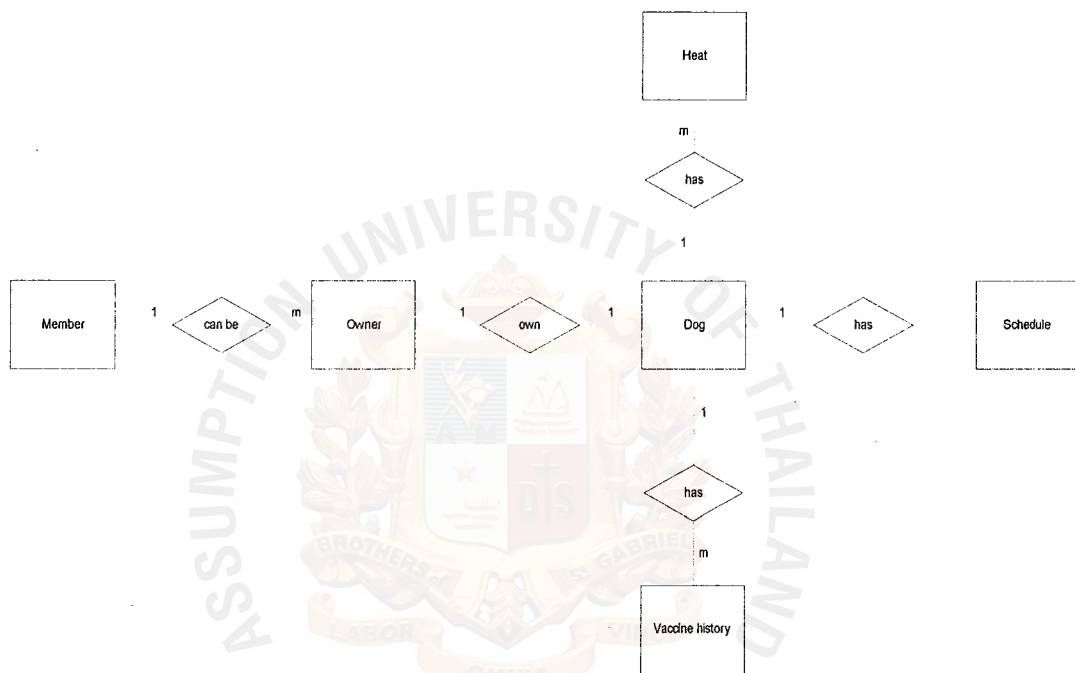
Source : Developed for this project

Figure 4.3 Context diagram



Source : Developed for this project

Figure 4.4 An Entity Relationship Data Model



Source : Developed for this project

4.4.2 Relation to database in Access

Every data in web page would be kept in the accessible tables. Hereunder are the tables in Access for keeping data.

1. Customer Table

Table 4.1

CustID	CustName	CustAddress	CustTel	CustEmail
--------	----------	-------------	---------	-----------

Source : Developed for this project

2. Dog Table

Table 4.2

DogID	DogName	DogSex	DogBreed	DogBirth	DogColor	DogSire	DogDam
-------	---------	--------	----------	----------	----------	---------	--------

Source : Developed for this project

3. Owner Table

Table 4.3

OwnerID	CustID	DogID
---------	--------	-------

Source : Developed for this project

4. Dog Detail Table

Table 4.4

InfoID	DogID	DogInfo
--------	-------	---------

Source : Developed for this project

5. Generation Table

Table 4.5

GenID	ParentID	ChildID
-------	----------	---------

Source : Developed for this project

6. Vaccination Table

Table 4.6

VacID	VacName	VacInfo	VacPeriod
-------	---------	---------	-----------

Source : Developed for this project

7. Vaccination List Table

Table 4.7

VID	DogID	VacDate	VacID	VacStatus	VacRemark	VacAlert
-----	-------	---------	-------	-----------	-----------	----------

Source : Developed for this project

8. Breeding Table

Table 4.8

Breed ID	Dog ID	Dog_Type_ID	Name	Gender	Dam ID	Sire ID	Seq no	Last update	Remark
----------	--------	-------------	------	--------	--------	---------	--------	-------------	--------

Source : Developed for this project

9. Dog Type Table

Table 4.9

Dog_Type_ID	Dog_Type_Name	Lastupdate	Remark
-------------	---------------	------------	--------

Source : Developed for this project

10. Estrus Table

Table 4.10

Dog_Type_ID	Dog_Type_Name	Lastupdate	Remark
-------------	---------------	------------	--------

Source : Developed for this project

11. Vaccination Schedule Table

Table 4.11

Vac ID	Dog ID	Date 30	Date 60	Date 90	Date 180	Date Year	V_Type_ID	Seqno	Last update	Remark
--------	--------	---------	---------	---------	----------	-----------	-----------	-------	-------------	--------

Source : Developed for this project

12. Vaccine Type Table

Table 4.12

V_Type_ID	V_Name	Remark
-----------	--------	--------

Source : Developed for this project

Web database is used as an application for the proposed system. A web database is a data store or information repository that can be accessed via a query language or programming API (application programming interface). The capability to integrate a database into applications that can be accessed by users utilizing a Web browser is what makes a database a Web database. With the web database, this access is not typically performed using instructions typed at a command line or issued through interfaces that are customer designed for use on a specific computer platform. Web database are accessed via other Web applications. It enables the user to design applications solely for the purpose of querying a database and returning specific information. It can also use information pulled from a database to support more comprehensive applications.

4.4.2 Web page design

The proposed web page is designed based on the basis of the user-friendly. The buttons and symbolic metaphors located on the main page of the web site must be clear for the meanings they stand for. The extraordinary fancy may draw attention from the visitors but it is useless if the links and functional buttons are hard to understand and use. Furthermore, the legibility is another criterion that must be considered. The size of the font used must be big enough that people can read. The use of colors and backgrounds is essential for web page design as well. Using in appropriate graphic or design would

intervene with the eye's capability to resolve the lines in the characters and recognize word shapes.

4.4.3 Hardware and software specification requirement

The requirement specification of the proposed system could be divided into two parts, which are hardware requirement specification and software requirement specification.

For the hardware requirement, the proposed system needs only one computer for operating kennel administration. The hosting will be outsourced.

Table 4.13 The hardware requirement specification

Hardware	Specification
CPU	Intel Pentium III - 800 MHZ or higher processor
Cache	256 KB or higher
Memory	256 MB or higher
Hard disk	40 GB or higher
CD-Rom drive	Standard CD-ROM Drive
Floppy drive	1.44 MB
Network adapter	100 - Base T
Display adapter	SVGA card
Display	15" Monitor

Source : Developed for this project

Table 4.14 The software requirement specification.

Software	Specification
Operating System	Microsoft Windows 2000 Professional+IIS5
Web Browser	Internet Explorer 5.5 or later/Netscape
Database Software	Microsoft Access 2000

Source : Develop for this project

4.5 Evaluation

4.5.1 User Acceptance Test (UAT)

The user acceptance test is conducted in order to ensure that the proposed system meets the user's requirement. Here, users are kennel owners or breeders. The checklist is divided into 3 categories that are breeding function, kennel function and customer function. The testing is about the functionality and ability of features according to the requirements of the user.

The result of the user's acceptance testing shows that the proposed system can fulfill all requirements.

4.5.2 Cost/ Benefit analysis

In order to implement the proposed system, the initial cost will occur. The cost falls into two groups. The first is the cost of hardware, software that occurs only in the first time of implementation. The second falls into the operating cost that consists of the maintenance cost and the internet cost. This cost will happen throughout the lifetime of the system.

Table 4.15 Estimated cost for the proposed system

Cost Items	Years				
	1	2	3	4	5
Fixed Cost					
Hardware Cost:					
Computer Server	30,000.00	-	-	-	-
Total Hardware Cost	30,000.00	-	-	-	-
Software Cost:					
Microsoft Windows 2000 Professional Edition	2,500.00	-	-	-	-
Microsoft Office 2000 Standard Edition	15,000.00	-	-	-	-
Symantec Norton Anti-virus	10,000.00	-	-	-	-
Software Development Cost	15,000.00	-	-	-	-
Total Software Cost	42,500.00	-	-	-	-
Total Initial Cost	72,500.00	-	-	-	-
Maintenance Cost:					
Maintenance Cost/Annual	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00
Total Maintenance Cost	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00
Internet Cost:					
Domain registration	1,000.00	1,000.00	1,000.00	500.00	500.00
ISP monthly fee (1000bht.@12)	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00
Total Internet Cost	13,000.00	13,000.00	13,000.00	12,500.00	12,500.00
Total Proposed System Cost	90,500.00	18,000.00	18,000.00	17,500.00	17,500.00

Source : Developed for this project

System Benefits

The benefits would come from two segments: the trial mating software and the web site.

For the proposed trial mating software, it assists the breeder to increase the efficiency of matching and selecting of a sire and a dam that originate the quality of breeding. The process of breed development is the critical factor that leads business to succeed in the

kennel business. For the website, it helps the kennel increase the customer's satisfaction and creates the relationship between kennels and their customers.

Hereunder, the benefits are described in details as in the mentioned segments:

Benefits of trial mating software

1. Eliminate the human error in calculating the percentage of blood
2. Reduce time in the matching selection process
3. Establish where, in the pedigree, the inbreeding occurs
4. Identify the common ancestors and the amount they contribute to the overall inbreeding
5. Ascertain the rate of inbreeding per generation and trend analysis
6. Create a basic report of breeding analysis

Benefits of web site

1. Keep records of customers and their own dogs
2. Create a good relationship between the customer and the kennel

CHAPTER 5 : CONCLUSION

5.1 Summary of the result

The trial mating software is developed in order to help a kennel or a breeder to reduce time and increase efficiency in selecting and matching dogs to be a sire and a dam. It provides an automatic calculation for breeding analysis. The proposed system makes the study of pedigree easy and convenient. It also has the ability to find the common ancestor and analyze the percentage of blood in each trial mating.

Besides the result of this project shown in web based solution, the proposed website provides the kennel's customers access to view or add data of their own dogs. The data of the dogs will be kept updated via using internet connectivity. Therefore, the customers can login to the website to manage and track records of their dog anywhere and anytime. Moreover, the database of the customer would be a source of the customer database for kennels to support a customer relationship in the future as well.

5.2 Limitation of the project

This project consists of the development of the website and trial mating software for the kennel management. The limitations for this study are time constraint and budget. The benefits could be analyzed from costing and provided features of the system only.

5.3 Contribution of the project

As the kennel owner, the proposed system is contributed to the kennel management in terms of breed development. Because the matching selection is an influential process of breeding, the increased efficiency of blood percent calculation certainly enhances the quality of breeding. Furthermore, the database of customer would be useful to support the customer relationship management in the future.

5.4 Recommendations

Since the proposed system is designed and developed to correct the defined problems, some subjects that does not relate to the problem directly are overlooked. To make it more effective, the following should be considered:

- The content provided

The useful information should be provided to the customers through the web page.

- Web board

Web board provided will create the community of dog owners. The customers' questions would be posted on the web board so that the kennel could reply in a short time.

- Security and Privacy

The security issue must be considered if the system is implemented to the existing process.

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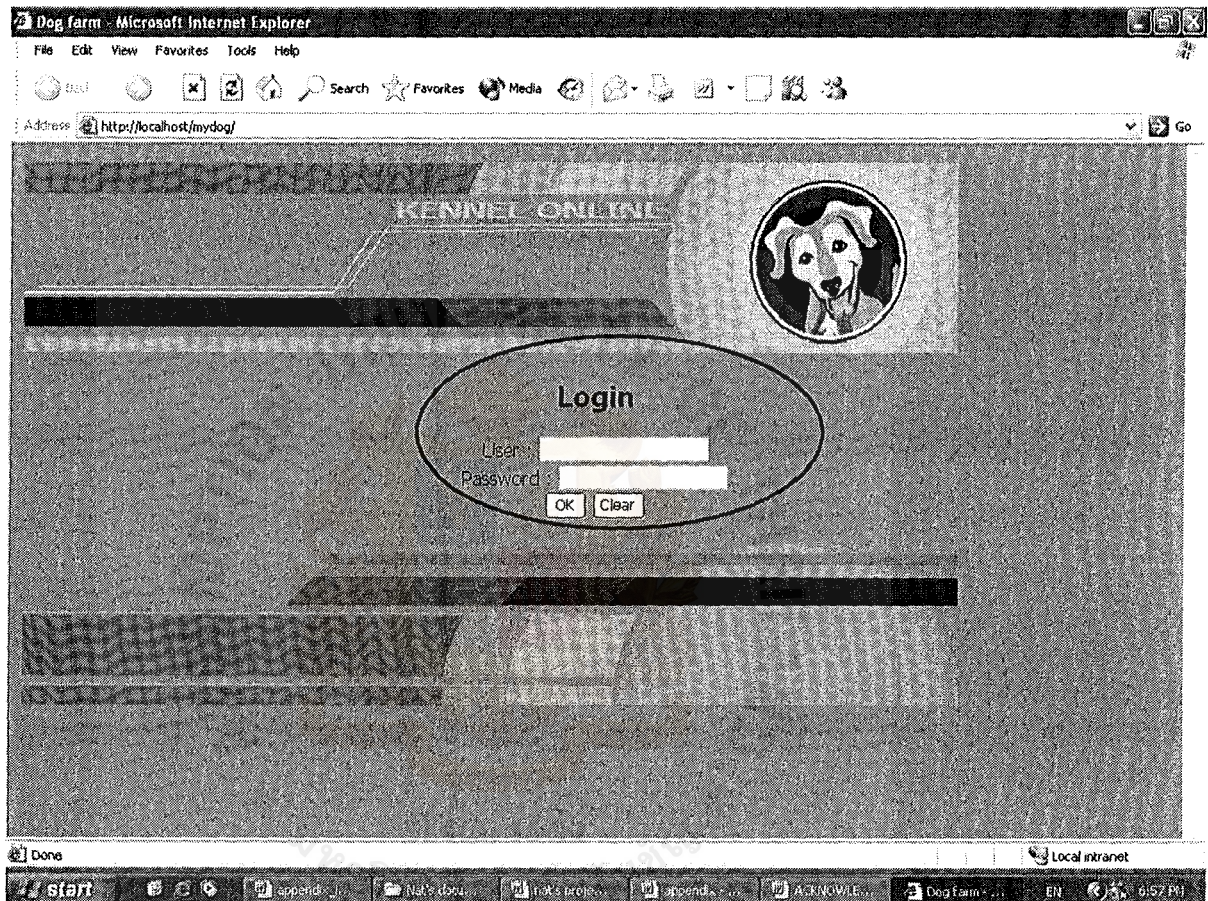


APPENDICES

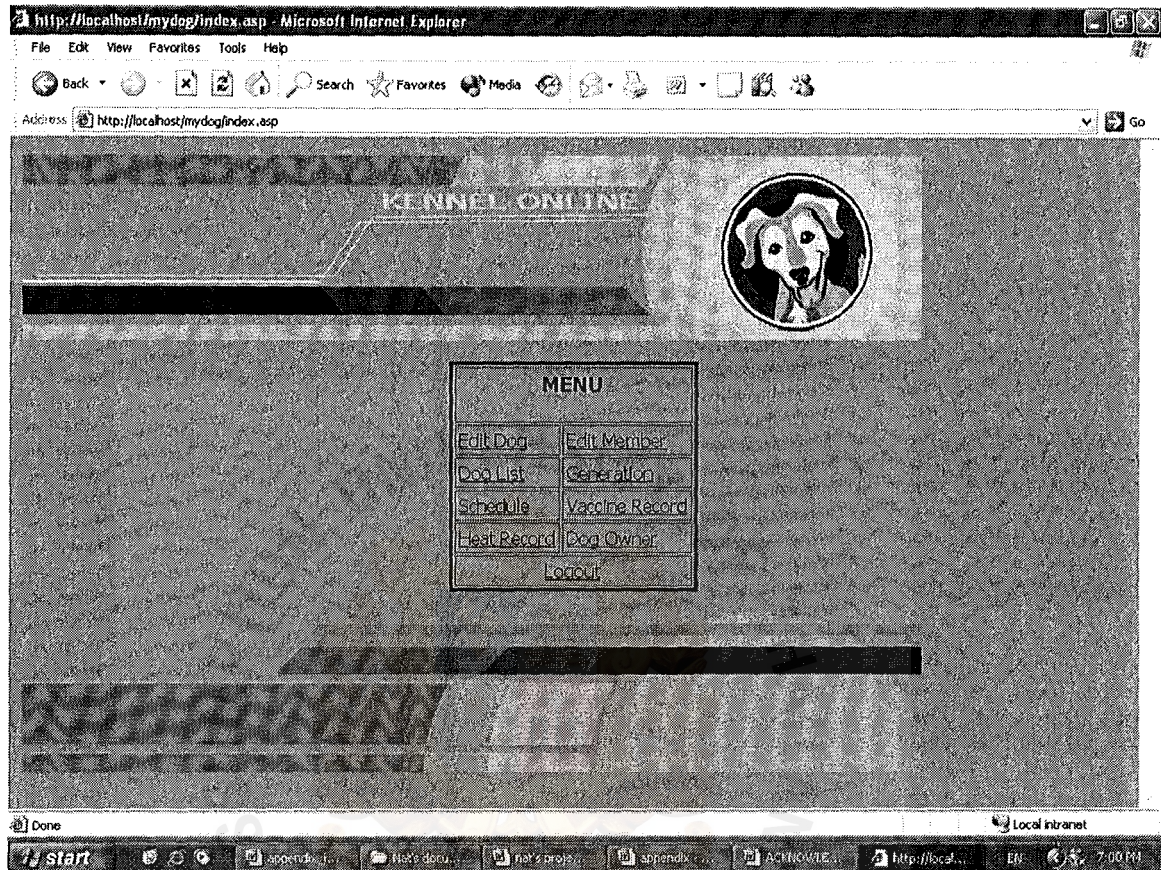
Appendix 1 : The User's Manual

1. Get into the home page

Insert the URL of the website, the home page would be shown as below. Then, the user must enter their username and password and click “ok”.

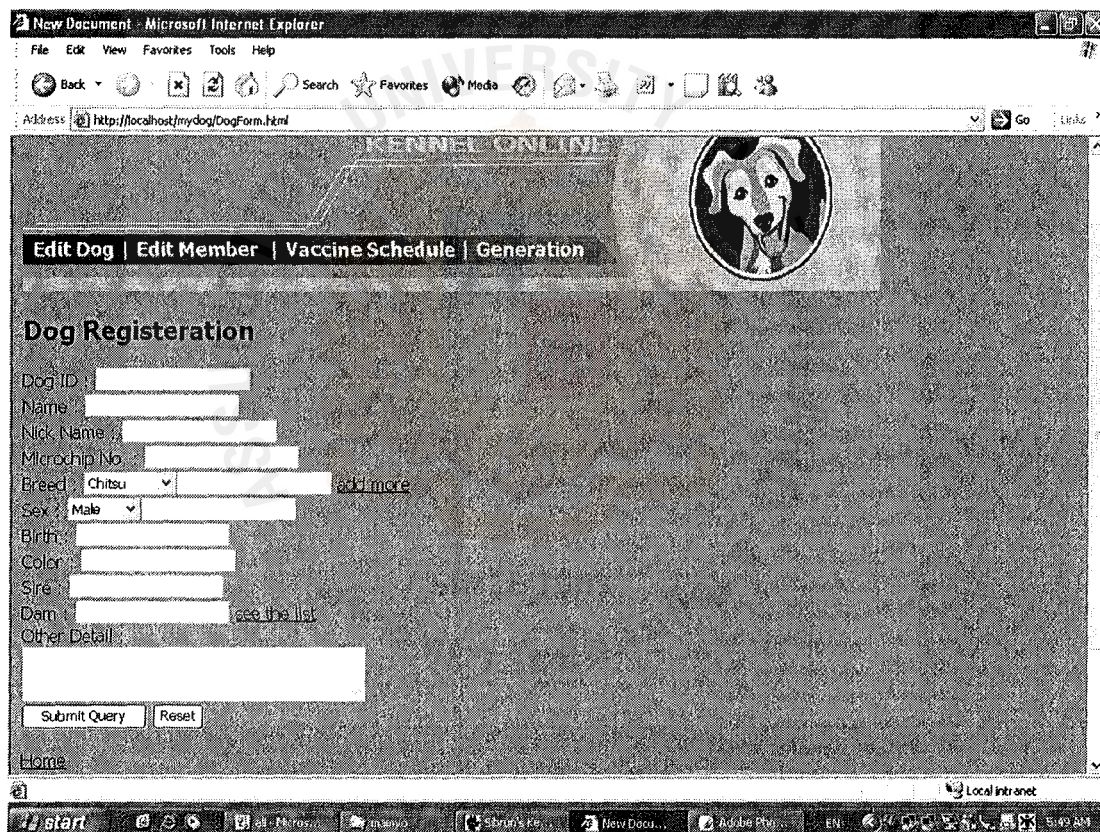


The menu page will be shown up.



2. Adding a dog

Firstly, the kennel must add a dog into the database by clicking at “add dog”. The dog registration page would be shown. Then, the application form will appear. The kennel must fill the information of the dog in the form. If you want to delete the filled information, click “reset”. The filled information would be erased. When information filling is done, click the “submit query” button. There would appear words “Add ok”. You can choose to add more or go back to the home page.



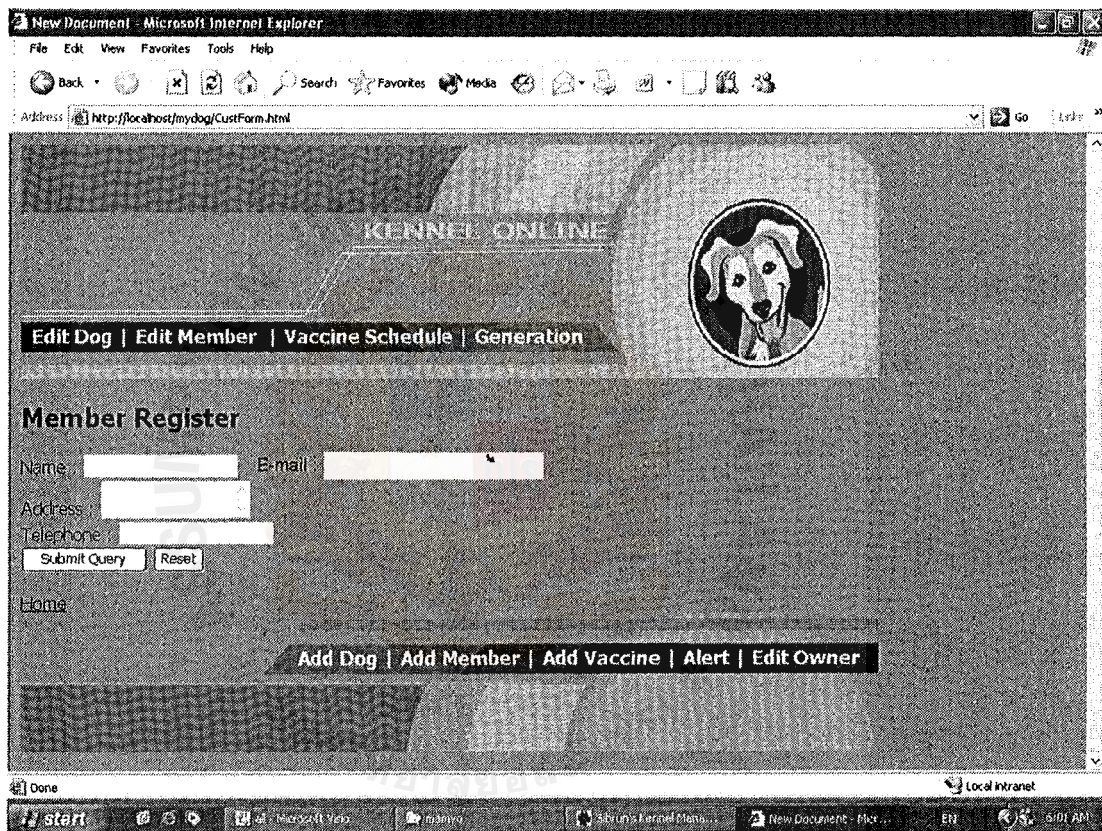
The screenshot shows a Microsoft Internet Explorer window with the address bar displaying `http://localhost/mydog/DogForm.html`. The website is titled "KENNEL ONLINE" and features a navigation bar with links: [Edit Dog](#), [Edit Member](#), [Vaccine Schedule](#), and [Generation](#). A circular logo of a dog's head is visible in the top right corner. The main content area is titled "Dog Registration" and contains the following form fields:

- Dog ID:
- Name:
- Nick Name:
- Microchip No.:
- Breed: [add more](#)
- Sex:
- Birth:
- Color:
- Sire:
- Dam: [see the list](#)
- Other Detail:

At the bottom of the form are two buttons: "Submit Query" and "Reset". A "Home" link is located at the bottom left of the page. The Windows taskbar at the bottom shows the start button and several open applications, including "all - Micro...", "mario", "Sbrun's Ke...", "New Docu...", and "Adobe Ph...". The system clock indicates 5:42 AM on a local intranet.

2. Adding a member

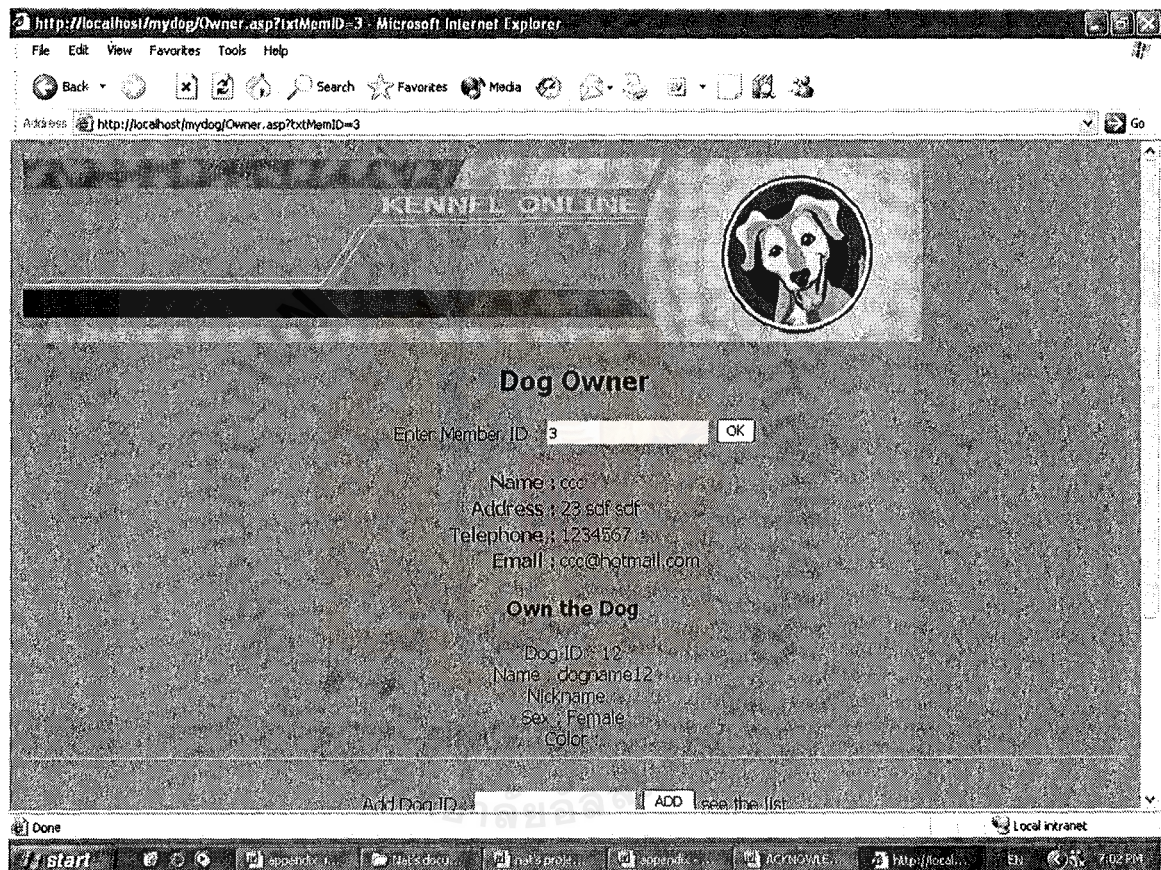
To add a member or a new customer, choose the menu “add member”. Then, member register page will be shown. Next, the kennel has to key in the information of the customer. Finally, click “submit query” to save the information.



The screenshot shows a Microsoft Internet Explorer window with the address bar displaying `http://localhost/mydog/CustForm.html`. The webpage has a dark, textured background with a circular logo of a dog's head in the top right corner. The title "KENNEL ONLINE" is centered at the top. Below the title, a navigation bar contains the links: "Edit Dog | Edit Member | Vaccine Schedule | Generation". The main section is titled "Member Register" and contains a form with the following fields: "Name", "E-mail", "Address", and "Telephone". Below these fields are two buttons: "Submit Query" and "Reset". A "Home" link is located below the form. At the bottom of the page, another navigation bar contains the links: "Add Dog | Add Member | Add Vaccine | Alert | Edit Owner". The Windows taskbar at the bottom shows the "start" button, several open applications, and the system clock displaying "5:01 AM".

3. Defining the owner and the dog

After adding a dog and a member , the kennel must add the information to define the owner of the dog. This step would be done when the dog is sold out. To do so, click at “dog owner” and the kennel must key in the member ID., Then, the below screen would be shown.



The screenshot shows a Microsoft Internet Explorer window with the address bar displaying `http://localhost/mydog/Owner.asp?txtMemID=3`. The page has a header with the text "KENNEL ONLINE" and a circular logo of a dog's face. The main content area is titled "Dog Owner" and contains the following form fields:

- Enter Member ID:
- Name : ccc
- Address : 23 sdf sdf
- Telephone : 1234567
- Email : ccc@hotmail.com

Below these fields is a section titled "Own the Dog" with the following form fields:

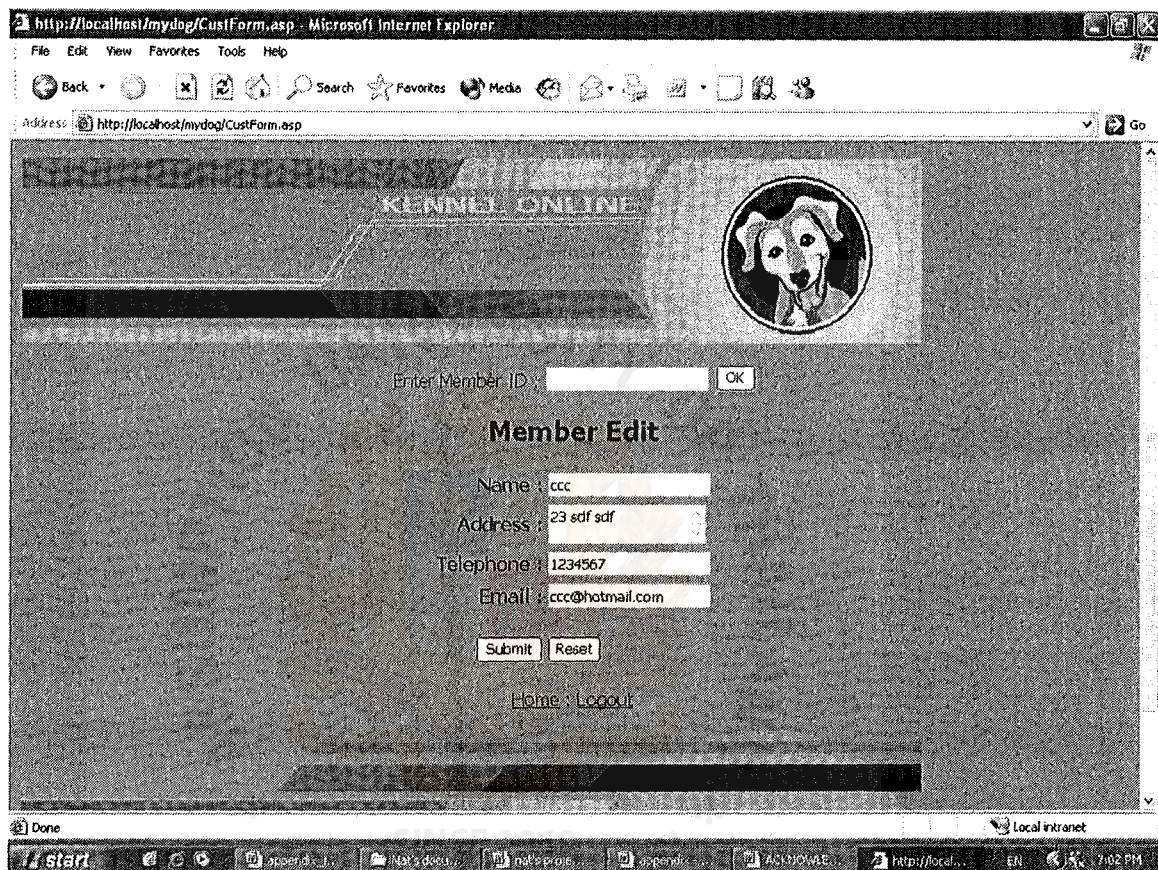
- Dog ID : 12
- Name : dogname12
- Nickname :
- Sex : Female
- Color :

At the bottom of the form, there is a field "Add Dog ID:" followed by an button and a link "see the list". The browser's status bar at the bottom shows "Done" and "Local intranet".

In case that the customer owns more than one dog, it is able to add more dogs. To do so, insert the dog ID and then click at “add”. The system will update the information automatically.

4. Editing the member

Kennel can change the information of a member by clicking at “edit member” The edit member page would be shown up below. After changing the information, you must click “submit query” to save the updated information everytime.



The screenshot shows a Microsoft Internet Explorer window with the address bar displaying `http://localhost/mydog/CustForm.asp`. The page title is "KENNEL ONLINE" and features a circular logo of a dog's head. Below the logo, there is a form titled "Member Edit". The form includes fields for "Name", "Address", "Telephone", and "Email", each with a corresponding input box. The "Name" field contains "ccc", "Address" contains "23 sdf sdf", "Telephone" contains "1234567", and "Email" contains "ccc@hotmail.com". There are "Submit" and "Reset" buttons at the bottom of the form. Above the form, there is a section labeled "Enter Member ID" with an input box and an "OK" button. At the bottom of the page, there are links for "Home" and "Logout". The Windows taskbar at the bottom shows the "start" button, several open applications, and the system clock displaying "7:02 PM".

http://localhost/mydog/CustForm.asp · Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print

Address http://localhost/mydog/CustForm.asp Go

KENNEL ONLINE

Enter Member ID: OK

Member Edit

Name:

Address:

Telephone:

Email:

[Home](#) [Logout](#)

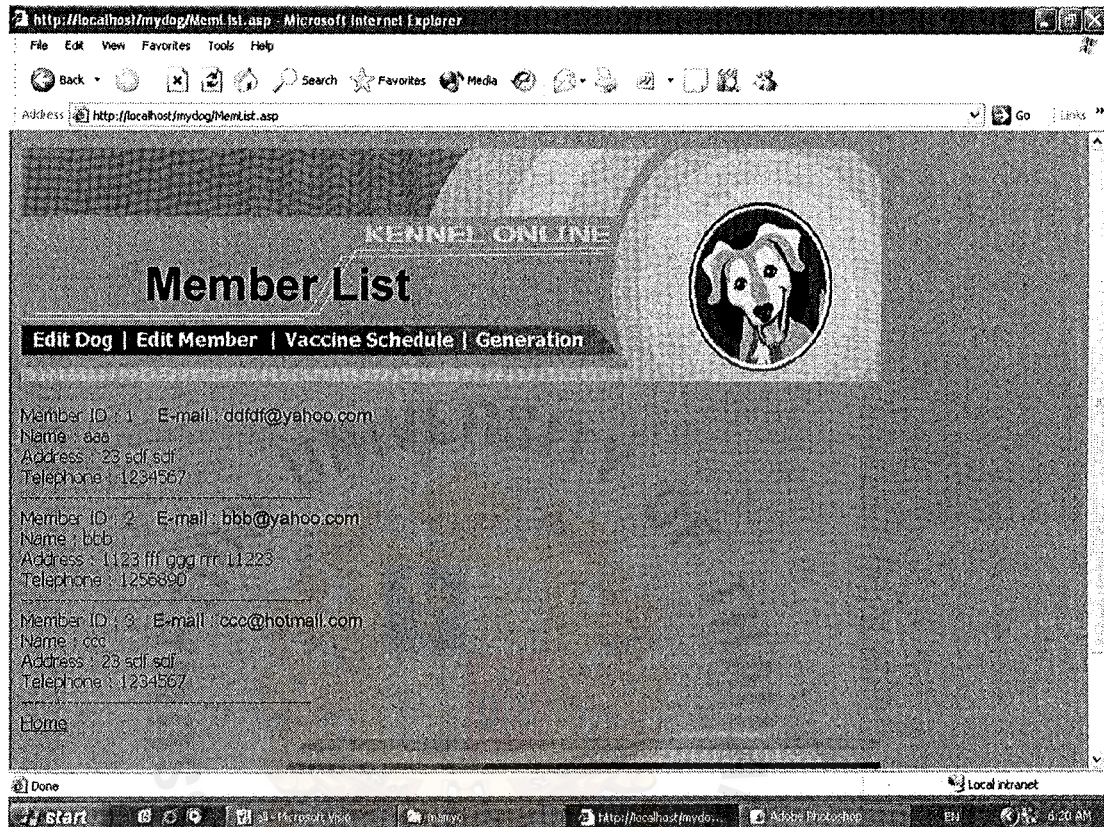
Done Local intranet

start append.docx Nat's docu Nat's proje append... ACKNOWLEDGE http://local... EN 7:02 PM

5. Viewing the member list

To view the list of members or customers, the kennel must choose the member list menu.

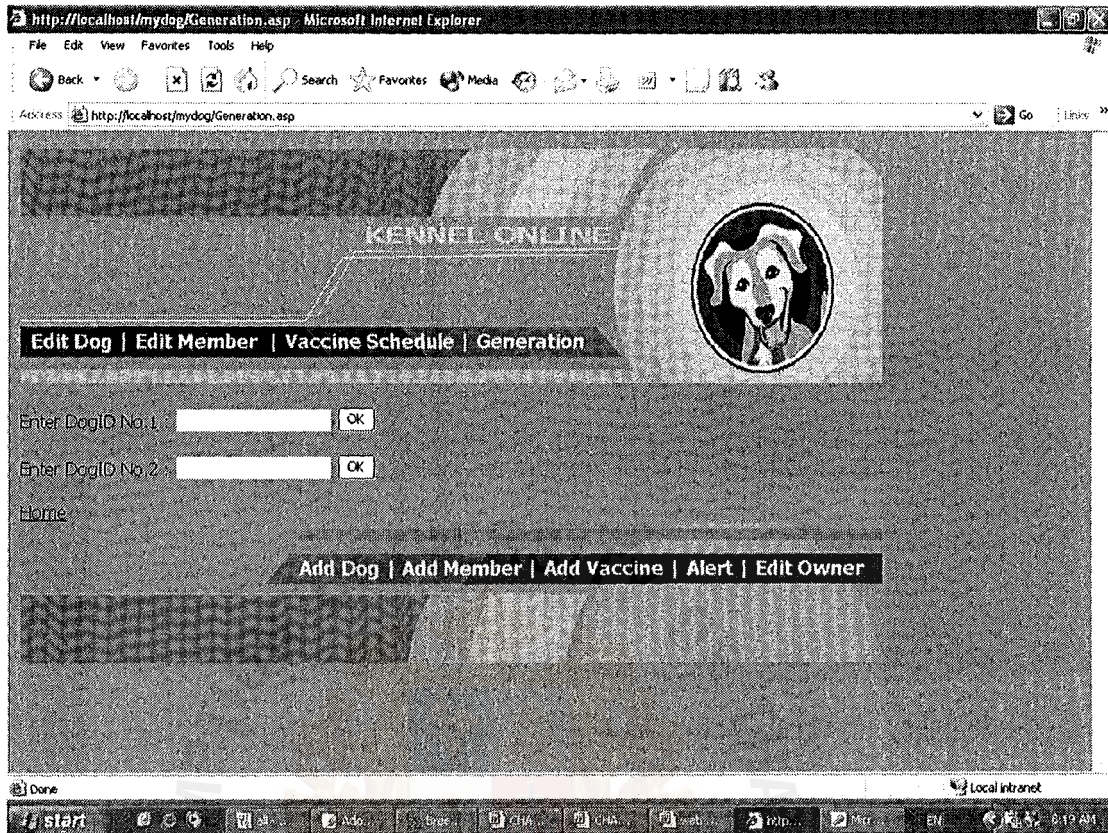
Then, the list would be shown up below.



The details in this page will consist of member ID, customer name, address, telephone and e-mail address.

6. Mating function

The kennel can do matching between a sire and a dam by selecting generation menu.



The above page will be shown. You have to input the ID of the dog that you want to do the matching and then click "ok".

The system will create the pedigree of the litter that will be given from the trial matching.

Also, the report of breeding could be shown below.

http://localhost/mydog/Generation.asp?txtDogID1=3 - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print

Address http://localhost/mydog/Generation.asp?txtDogID1=3 Go

KENNEL ONLINE

Enter DogID No.1: The dog no.3: Female

1: dogname4	6: dogname6	10: dogname10
	7: dogname7	11: dogname11
		12: dogname12
		13: dogname13
5: dogname5	8: dogname8	14: dogname14
	9: dogname9	15: dogname15
		16: dogname16
		17: dogname17

Enter DogID No.2: dogname1: Male

6: dogname6	10: dogname10	16: dogname16
	11: dogname11	12: dogname12
	12: dogname12	4: dogname4
		13: dogname13
		14: dogname14

Done Local intranet

start appendix_1... Nat's docu... Nat's prote... appendix... ACQUOWLE... http://local... EN 7:04 PM

http://localhost/mydog/Generation.asp?txtDogID1=3 - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print

Address http://localhost/mydog/Generation.asp?txtDogID1=3 Go

13: dogname13	5: dogname5
---------------	-------------

percent	Dog Name	Sex	Color
50.00%	The dog no.3	Female	white
81.25%	dogname4	Male	red
31.25%	dogname5	Female	red
37.50%	dogname6	Male	green
37.50%	dogname7	Female	white
12.50%	dogname8	Male	white
12.50%	dogname9	Female	red
18.75%	dogname10	Male	
18.75%	dogname11	Male	
25.00%	dogname12	Female	
18.75%	dogname13	Female	
6.25%	dogname14	Male	black
6.25%	dogname15	Female	white
12.50%	dogname16	Male	black
6.25%	dogname17	Female	white

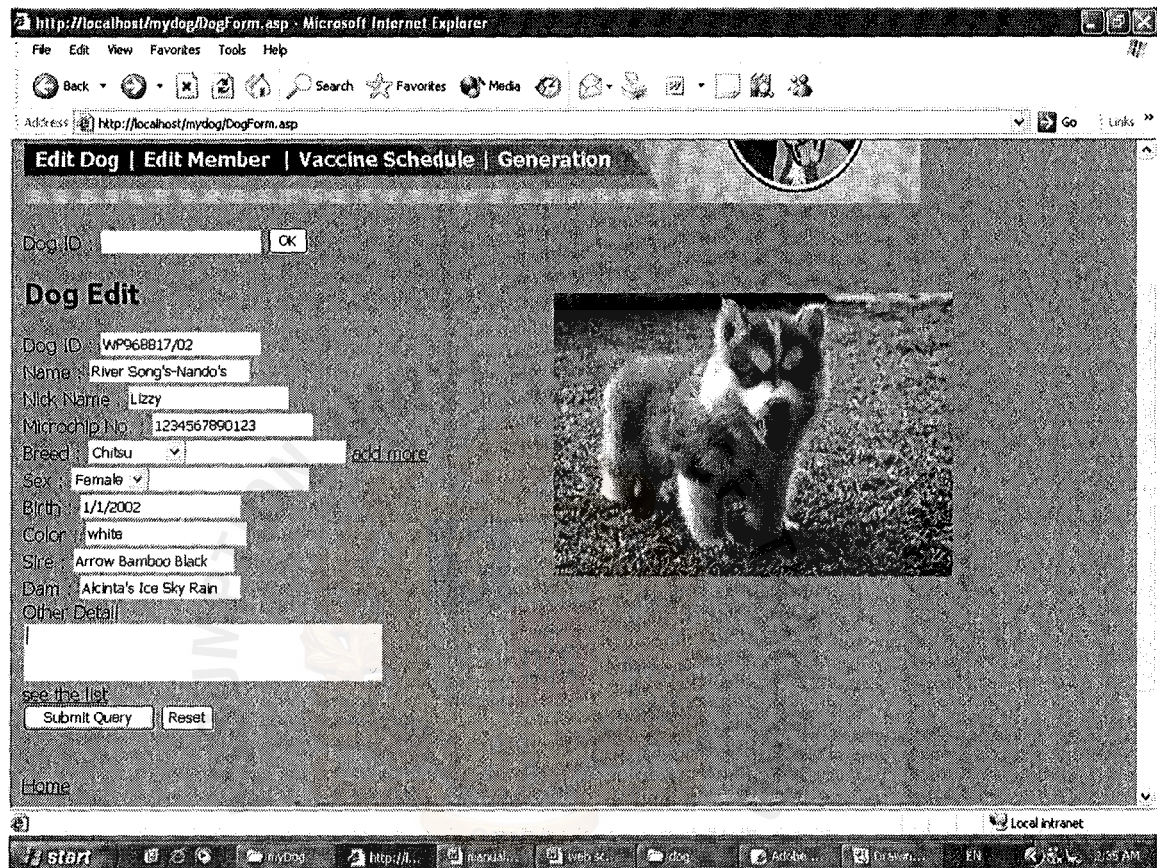
Home

Done Local intranet

start appendix_1... Nat's docu... Nat's prote... appendix... ACQUOWLE... http://local... EN 7:04 PM

7. Editing a dog's information

The user can choose to view or edit the information of their dogs by clicking “edit dog”



http://localhost/mydog/DogForm.asp - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Reload Home Search Favorites Media Print Mail

Address http://localhost/mydog/DogForm.asp Go Links

Edit Dog | Edit Member | Vaccine Schedule | Generation

Dog ID

Dog Edit

Dog ID

Name

Nick Name

Microchip No

Breed

Sex

Birth

Color

Sire

Dam

Other Detail

[Home](#)

Local intranet

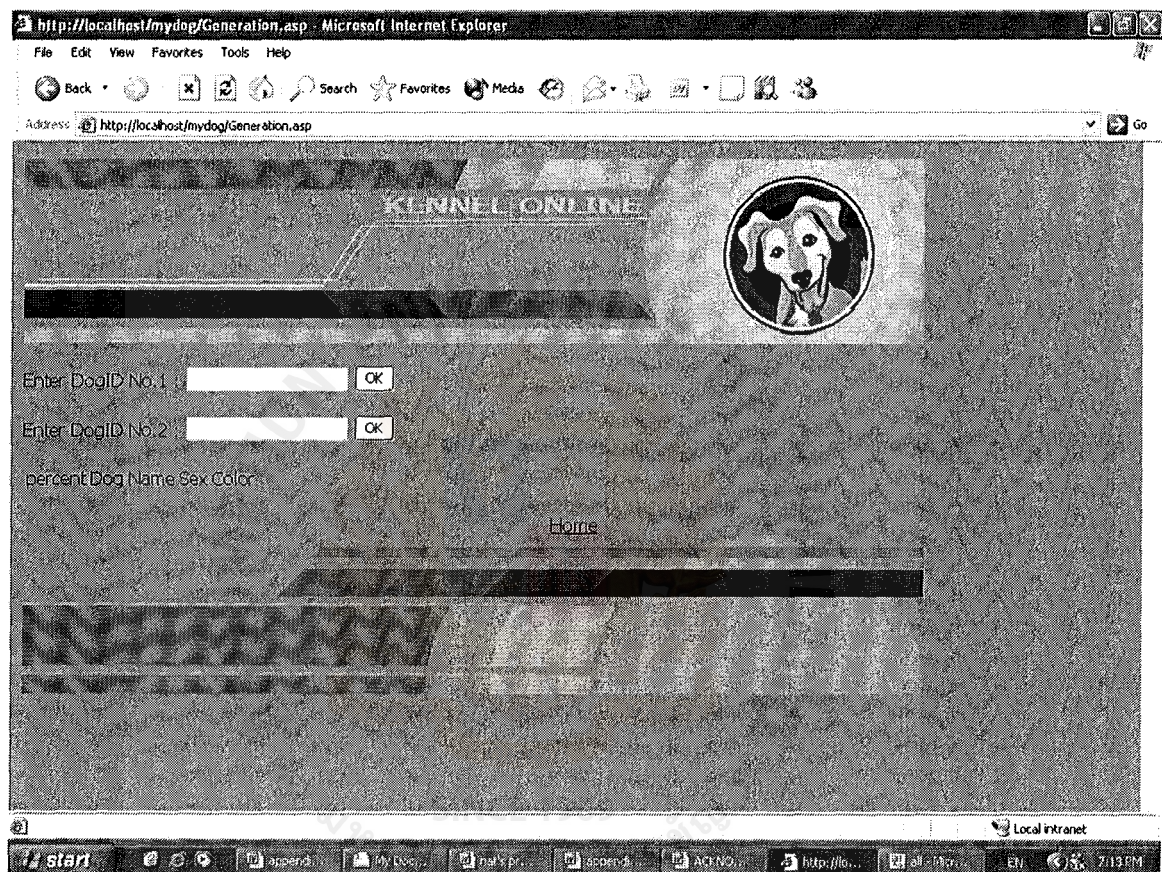
start myDog http://... myDog... dog... Add the... EN 2:55 AM

Then, the “dog edit” page will be shown up. The user can view the information of their dog such as name, nick name, microchip no, breed, sex, date of birth, color, the name of the dog's sire and dam. Also, the user is allowed to add other details of their dogs such as training, rewards and etc.

There are many options provided for the user which are vaccination history, photo added and view pedigree.

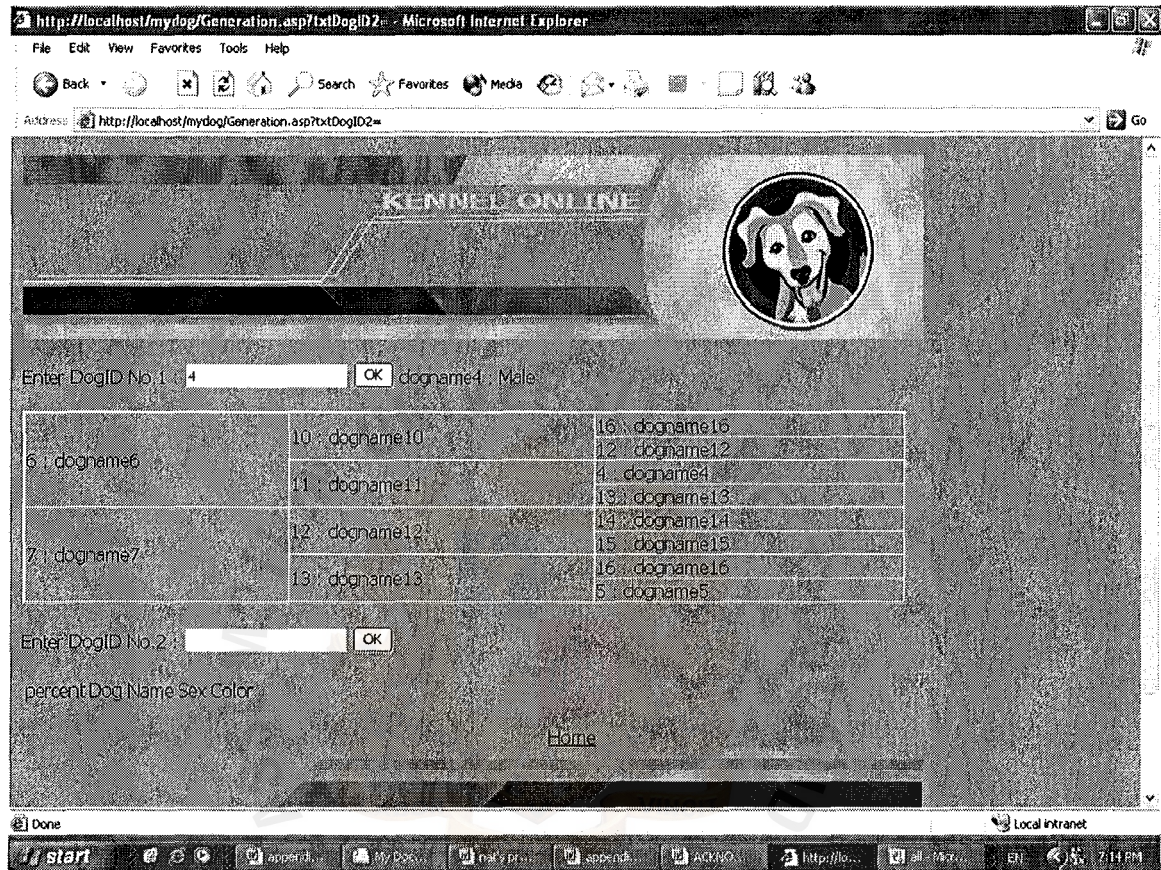
8. Viewing the pedigree

User can view the pedigree of a dog by using the “generation” menu. Then, the below page will be shown up.



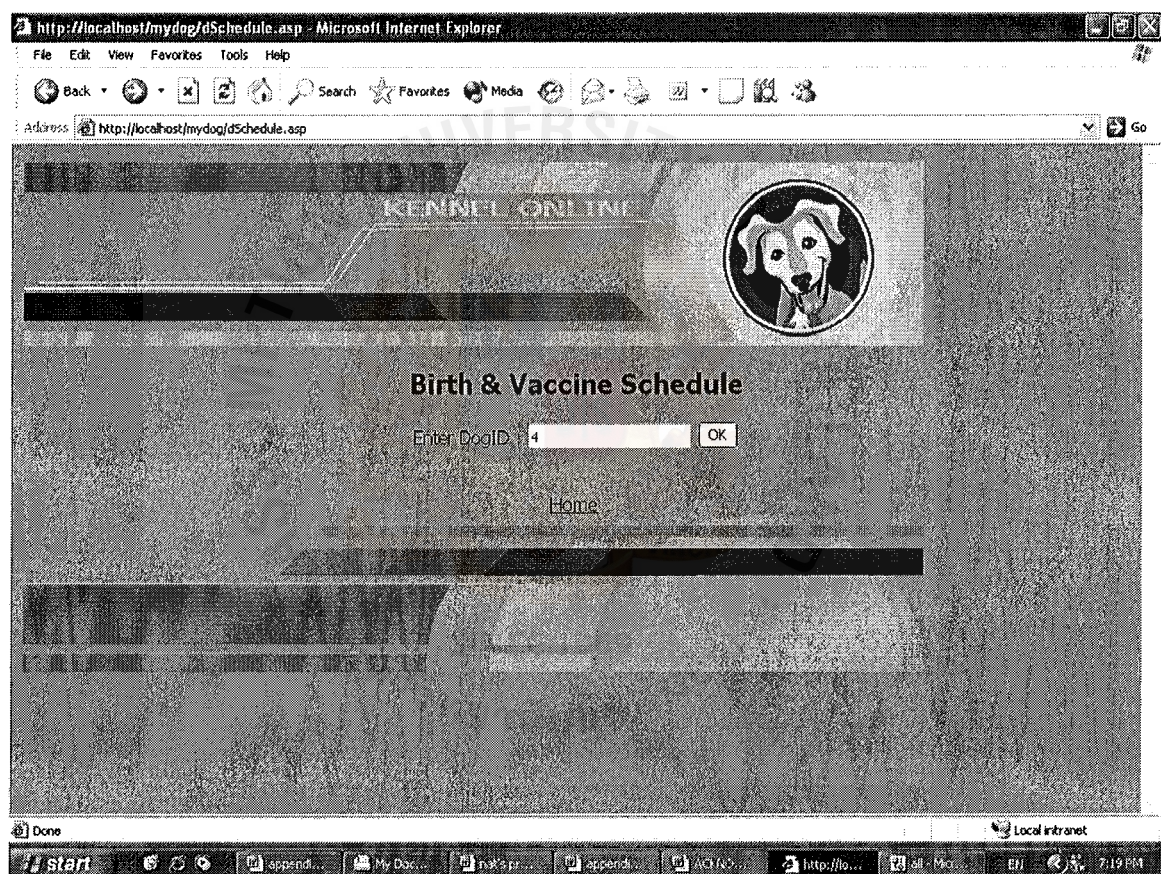
The user has to insert the dog's ID. No and then click “OK”.

Then, the pedigree would be shown up below.



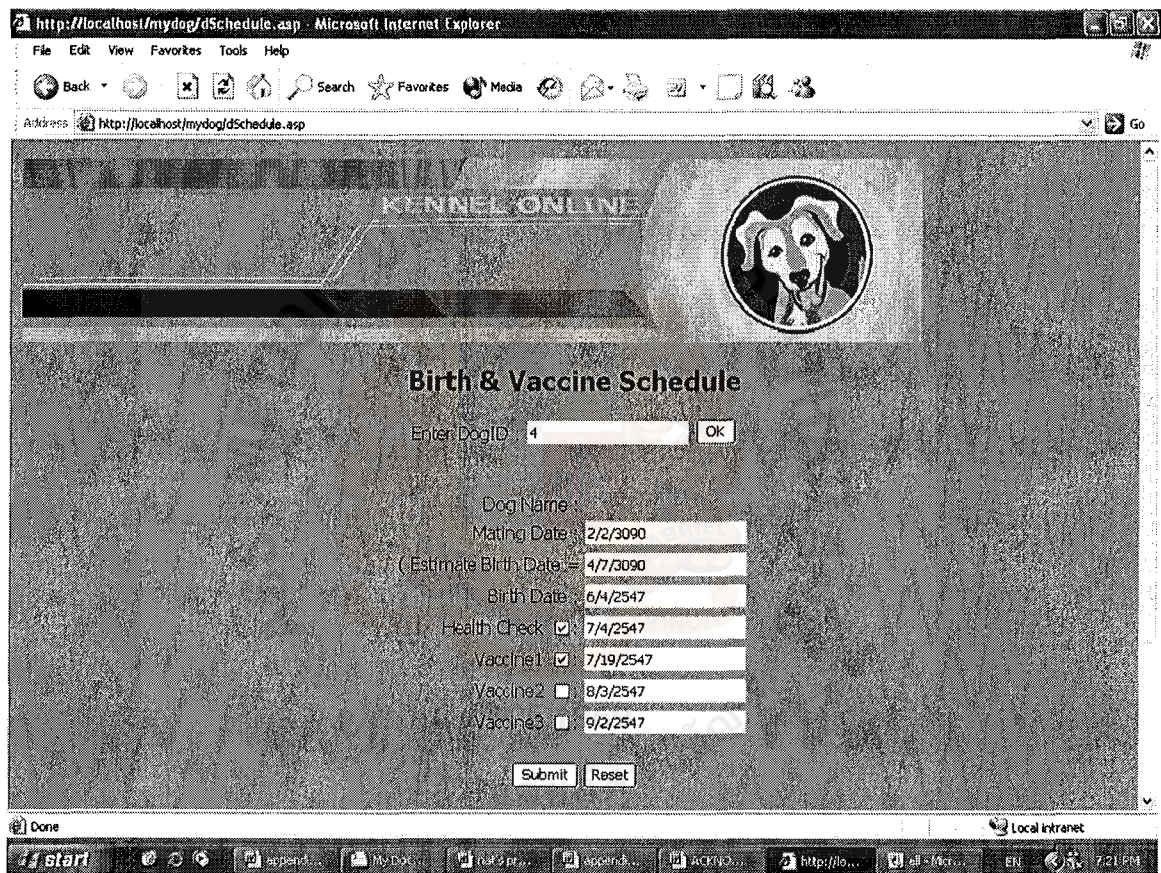
9. Birth and vaccination schedule

The below page is birth and vaccination schedule. The user can get into this page by clicking “schedule” in the menu page. Then, the user has to enter the ID No. of dog and click “OK”.



To calculate the estimate whelping date (birth date), the user has to insert the mating date of the dog and the system will generate the expected whelping date automatically.

Moreover, this page also provides the information of the vaccination schedule for that dog. It will show the date that the puppy should get the first, second and third vaccinations in the first 3 months of its birth.



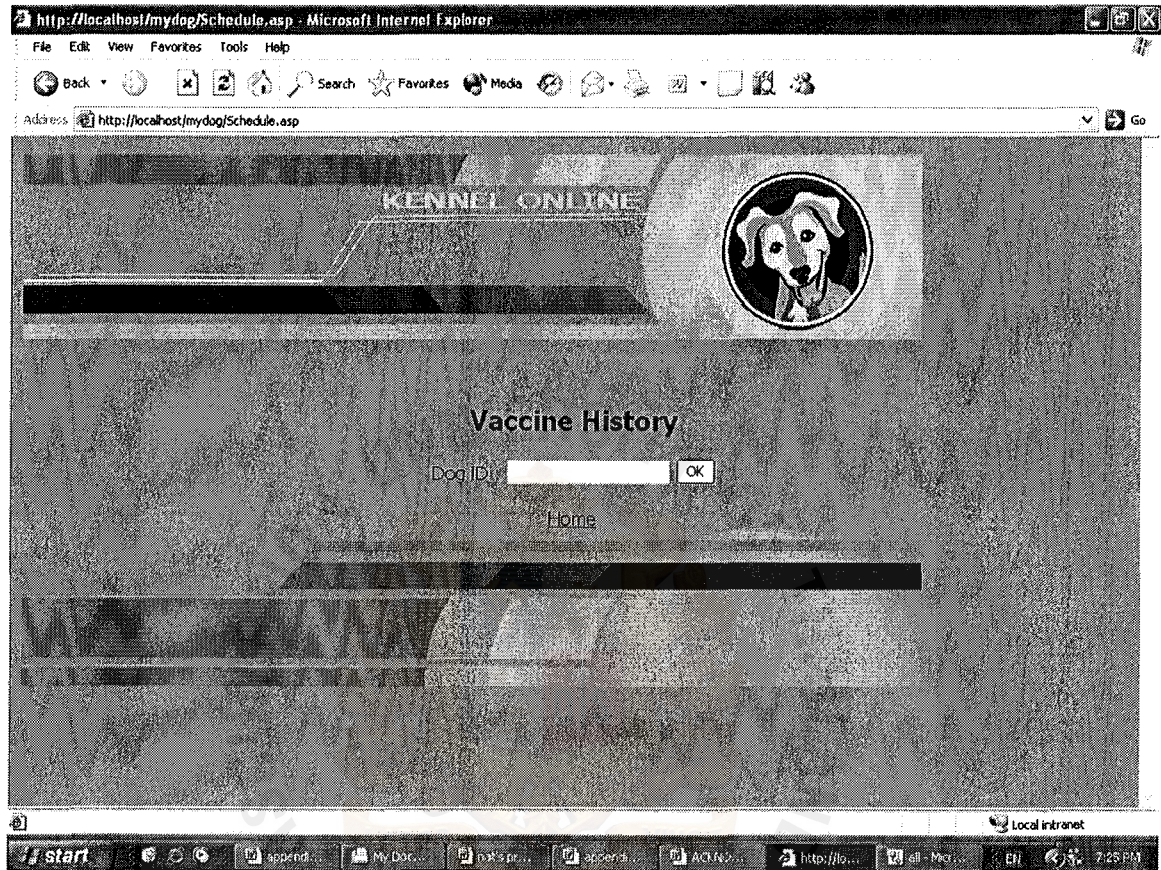
The screenshot shows a web browser window with the address bar displaying `http://localhost/mydog/dSchedule.asp`. The page title is "KENNEL ONLINE" and features a circular logo of a dog's head. The main heading is "Birth & Vaccine Schedule". The form contains the following fields and controls:

- Enter DogID:** A text input field containing the value "4" and an "OK" button.
- Dog Name:** A text input field.
- Mating Date:** A date input field containing "2/2/3090".
- (Estimate Birth Date:** A date input field containing "4/7/3090".
- Birth Date:** A date input field containing "6/4/2547".
- Health Check:** A checkbox labeled "Health Check" is checked, with a date input field containing "7/4/2547".
- Vaccine1:** A checkbox labeled "Vaccine1" is checked, with a date input field containing "7/19/2547".
- Vaccine2:** A checkbox labeled "Vaccine2" is unchecked, with a date input field containing "8/3/2547".
- Vaccine3:** A checkbox labeled "Vaccine3" is unchecked, with a date input field containing "9/2/2547".
- Submit** and **Reset** buttons are located at the bottom of the form.

The browser's taskbar at the bottom shows the "start" button, several open application windows, and the system clock displaying "7:21 PM".

10. Vaccination Record

The feature of vaccine record allows the user to keep records of vaccination history of their dogs. By clicking at “vaccine record”, the user will get into the below page.



After inserting the dog's ID No., the below page would be shown up in the next step.

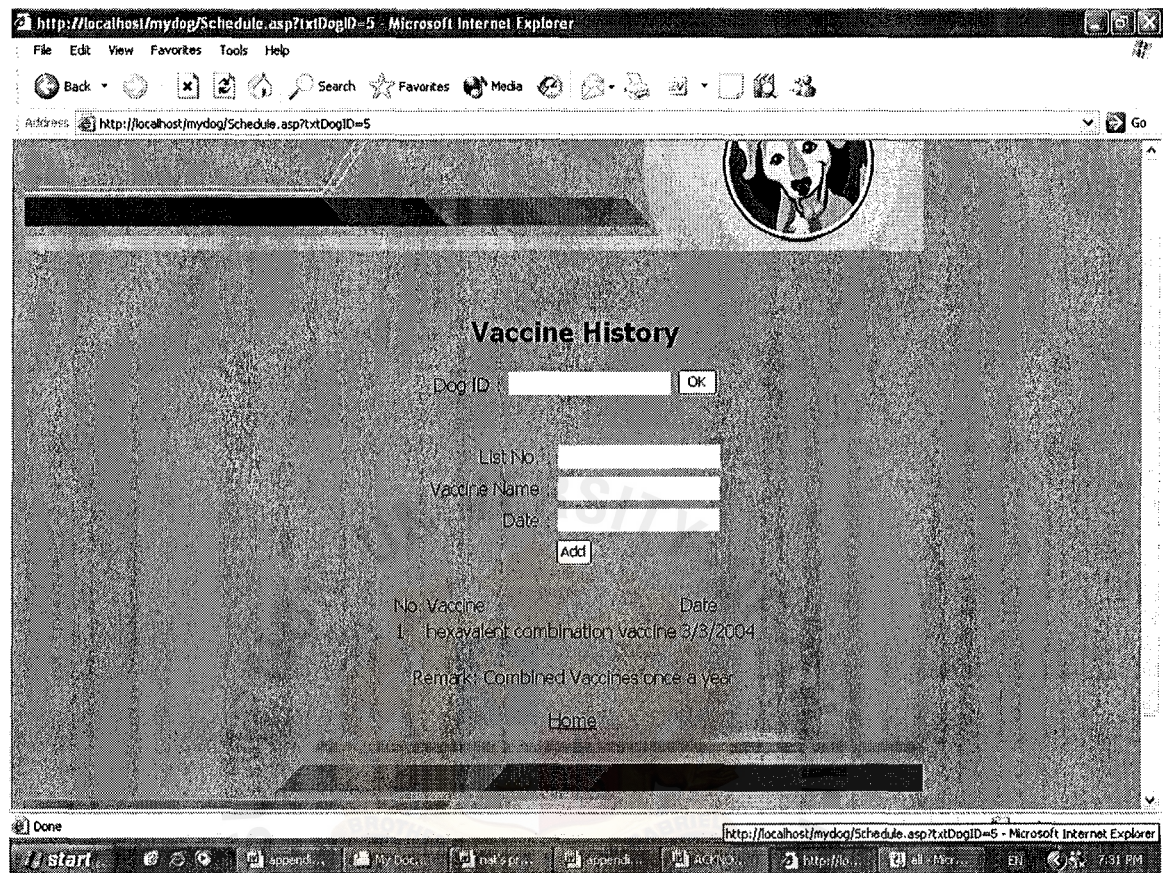
The screenshot shows a web browser window titled "http://localhost/mydog/Schedule.asp - Microsoft Internet Explorer". The browser's address bar displays "http://localhost/mydog/Schedule.asp". The page content is titled "Vaccine History". It features a form with the following fields and controls:

- Dog ID:** A text input field followed by an "OK" button.
- List No.:** A text input field.
- Vaccine Name:** A text input field.
- Date:** A text input field.
- Add:** A button to submit the form.
- Remark:** A text area containing the text "Combined Vaccines once a year".
- Home:** A link to return to the home page.

The browser's status bar at the bottom shows "Done" and "Local intranet". The taskbar at the very bottom displays the "start" button and several open applications, including "spread...", "My Doc...", "nat's pr...", "appendi...", and "AC PWD...". The system clock shows "7:28 PM".

The user can put the record of vaccine name and the date that the dog was vaccinated and then click "add".

The system will keep and update the records automatically as shown below.



Appendix 2 : Interview report

The interview report

In order to collect the data and get user's requirements, the following persons were interviewed :

- 1) Mr. Kanok Boon-anan from Q Kennel
- 2) Mr. Worapol Silapi from Sparta Kennel

Q : Please describe the process of breeding

A : Firstly, the breeder must plan and decide whether the breeding will be inbreeding, line breeding or out crossing. Mostly, breeders choose line breeding because the litter from this breeding type always has good qualities. Then, the next step is the sire or dam selection that must conform to the breed standard. In this step, many features will be considered, such as the structural characteristics, correct temperament and well movement. Moreover, the basic concept of the dog selection is both the sire and the dam must not have the same undesired characteristics in order to prevent the inherited poor genes in litters. This concept is based on the genetic theory. For example, if the selected sire has short legs, the dog that will be dam must not have short legs. The breeder must select the dog that has good characteristics to get rid of undesired characteristics.

After the mating selection, the pedigree delved will be conducted with the objective to check the relationship of the ancestor base on the selected breeding type. If the selected type is linebreeding, both the sire and the dam must have distant relationship. Mostly, the pedigree examination would be done in 3 to 5 previous generations. Besides the pedigree delved, the history of giving litters of dogs and genetic problems are another issues that must be investigated also.

Then, the following step is blood percentage calculation. The objective of the analysis is to measure the genetic contribution of a certain ancestor to a selected dog or a proposed litter. The calculation method sums up the contributions for the ancestor each time that ancestor appears in the pedigree, and adjusted by the factor $(1/2)^n$ raised to the power n , where n is the number of generations back in the pedigree, e.g., for a sire or dam, $n = 1$ and therefore the Percentage of Blood from either parent is 50%, for a grandsire or grandam, $n = 2$, giving a Percentage of Blood of 25%, etc. The percentage of blood is often used when inbreeding or line breeding is being discussed.

Q : Please identify the problems found in kennel management.

A : The first problem is time consuming in mating selection that consists of the pedigree examination and the blood percentage calculation.. This process is quite repetitive and boring. Normally, 5 generations of dogs are recommended for tracing back. It means that there are 128 dogs to be investigated. It is hard to comprehend manually. Moreover if an error occurs, the analysis must be re-done from the beginning.

The second problem is the relationship with customers. At present, there is no customer database. So it is hard to track the sold dogs and customers. Sometimes the customers want the kennel to find a dog to mate with their dogs. But the available sires and dams in the kennel may not meet their breeding requirement. The kennel has to look at the data of the past sold dogs to response the customer's requests. Besides, the customers always call the kennel to ask for the personal information of their dogs because they lost the pedigree certification. However, if the dog was sold long time ago, the kennel is not able to answer their question due to the unavailability of the database.

Q : In order to solve the problems, what features should be in the proposed system?

A : First, the system should be able to keep basic information of dogs. The essential information is the dog's name, pedigree code number, microchip number, date of birth and sex. Due to the need to view the physical characteristics of the dog, the system should be able to show the picture also. Besides the basic information, the records of vaccination is needed to be kept for further follow-up of the health care issue.

Second, the system should have the feature of keeping records of the heat or estrus period. Due to the high investment in buying a dog to be a dam, mating must be planned in advance because the bitch can give birth only in the estrus period. Normally, the estrus period of the dog is twice a year and the female dog will have the estrus period about 30 times for her whole life. But the appropriate time for breeding is from 2 to 8 years old. Furthermore, the ratio of breeding and not breeding is 2:1 in order to keep the bitch in healthy condition. So the number of the productive estrus period will be reduced to 10 times for the bitch's whole life.

The next feature is the mating analysis feature. As the mentioned problem, the blood percentage calculation is repetitive and time consuming work. The system should be able to do trial mating analysis and make mating simulation for comparison. The result of blood percentage calculation should be analyzed and shown automatically.

Fourth, the system should help in forecasting the whelping date and vaccination of litters after the successful mating. Normally the pregnancy of a bitch is 64 days and the vaccination is 30, 45 and 60 days from whelping date. As soon as the mating date is keyed in, the estimated whelping date should be generated automatically. However, the estimated date may not be the exact whelping date. The system should allow to insert the exact whelping date and generate the date for vaccination by using this information.

Finally, the system should enhance in customer relationship management of the kennel. The customers of the kennel should be able to use the system to view or keep record,

scheduling or even do trial mating by themselves. Each customer must have their own username and password to log into the system. So they will be able to manage record of their dog only. The system must be able to identify the customers and their own dogs in order to help the kennel manage the customers and tracking the sold dogs.



